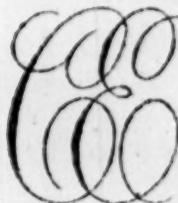


A
S Y S T E M
O F
S U R G E R Y.
B Y
B E N J A M I N B E L L,

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OF IRELAND AND EDINBURGH,
ONE OF THE SURGEONS TO THE ROYAL INFIRMARY,
AND FELLOW OF THE ROYAL SOCIETY OF EDINBURGH.

ILLUSTRATED WITH COPPERPLATES.

VOLUME I.
A NEW EDITION.



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T O

ALEXANDER MONRO, M. D.

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS, AND
PROFESSOR OF MEDICINE, ANATOMY, AND SURGERY,
IN THE UNIVERSITY OF EDINBURGH.

S I R,

THE chair you have so long
and so ably filled in this
University, and the rank you hold
in your profession, point you out
as a fit patron of such attempts as
are made by your countrymen, for
the improvement of the Art of
Surgery.

But I am actuated by another
motive when I address you on this
occasion. For, having commenced
the study of anatomy under your
auspices, I consider myself as in-

A 2 debted

iv DEDICATION.

debted to you in a particular manner, for any anatomical knowledge of which I am possessed. I have therefore to desire, that you will accept of this public testimony of my gratitude; and, if this first Volume of a System of Surgery merits any share of your approbation, may I request, as an additional obligation, the favour of that protection, which your countenance will be sure to afford it? I remain, very respectfully,

SIR,

Your obedient humble servant,

BENJAMIN BELL.

EPIN. NOV.
1782.

P R E F A C E

SOME years ago I published a Volume of Observations on different parts of Surgery; and the indulgent reception with which it was favoured, has encouraged me to lay another volume before the public: This, as well as the former, is intended as part of a work, which, when completed, will form a general System of Modern Surgery.

In announcing an undertaking so arduous and so extensive, it may be proper to explain the reasons which induced me to enter upon it, and to point out the plan upon which I intend to proceed.

The learned and judicious Heister published the last edition of his System of Surgery so long ago as the year 1739. In this work, the author comprehends whatever the experience of former times had approved as useful; and adds such observations as his own knowledge in Anatomy and practice in Surgery suggested.

This was the first, and it still remains the only, complete System of Surgery of which we are possessed.

Since this publication of Heister's, many valuable discoveries and important improvements have been introduced; and the Public has at different times been favoured with accounts of them by their respective authors. But these publications treat of various subjects, and are all necessarily unconnected with each other; so that the additional knowledge with which our art has been of late enriched, lies in a very diffused, and to many perhaps in an inaccessible, situation.

It is true, that some attempts have been made towards a full systematic arrangement of chirurgical subjects. Platner published his Institutes of Surgery in the year 1745; and Ludwig favoured the world with a similar publication in 1767. But both these works may be properly considered as heads of lectures which were read by those celebrated professors at Leipsic; and although possessed of much merit, they are too concise to give a clear and distinct idea of the various topics of which they treat.

In consequence of this, the young student in the art, as well as the intelligent practitioner who is desirous of information, is obliged to consult a great variety of publications, which he frequently finds much difficulty in procuring, and which his other occupations will not always allow him sufficient time to peruse.

Induced

Induced by these considerations, and having frequently experienced much inconvenience from the want of a well-digested System of Surgery, I have been led to attempt the present Work : Which, though it may not afford much new information to practitioners of experience and reflection, who are accustomed to peruse every publication that appears; yet to the younger part of the profession, and to all those whose opportunities of acquiring knowledge have not been considerable, I flatter myself it may prove serviceable.

My design is, to exhibit a view of the art of Surgery, as it is at present practised by the most expert surgeons in Europe, as far at least as my own observation in the course of attending different Hospitals, joined to the advantages of reading and correspondence, have enabled me to do so.

It may be proper to remark, that a number of improvements suggested at different times in various parts of Surgery, are here purposely omitted. Within these last thirty or forty years, such a rage has prevailed for the invention of new instruments, that it has become fashionable to accompany every publication with something new and singular of this kind. Some of these have undoubtedly been productive of much advantage : but the greatest part of them tend more to evince

the ingenuity of their authors, than to render the operations for which they were intended, more easily accomplished; for, although facility in performance is one great object in every surgical operation, yet the ends we have in view are in general attained by very simple means.

Indeed, one object of the present publication, is, an endeavour to divest the art of all that useless machinery with which it has been encumbered; and to retain only what appears evidently to rest upon the solid basis of experience. I have therefore been particularly attentive, in admitting nothing which I have not myself found confirmed by trial, or which I have not known to prove useful in the hands of others.

My connection with a large hospital, the Royal Infirmary of Edinburgh, to which the greatest part of the poor in Scotland requiring the assistance of chirurgical operations are accustomed to resort, together with that private practice which has fallen to my share, have given me opportunities both of repeatedly performing every operation myself, and of being frequently present when they were performed by some of the most expert surgeons of this place; a circumstance which enables me to speak with some degree of confidence, though, I hope with due caution, of each. With out such advantages, I should not have thought

my-

myself justifiable in undertaking the present Work; for it is chiefly by hospital practice that any individual can acquire such experience in the great variety of chirurgical operations, as to be able to form any accurate ideas concerning them.

It is not proposed in the course of the following Work, to attempt a particular systematic arrangement of the subjects of which it treats. Arrangements of this kind have indeed been employed with advantage in different branches of science: The study of natural history has been much facilitated by their means; and a knowledge of the more general diseases to which the human body is liable, is perhaps acquired with more ease by the comprehensive views which a well digested nosological system gives of them. But, as disorders of every kind requiring the assistance of the operative part of Surgery, are perfectly local and unconnected with one another by means of symptoms common to each; and as it seldom happens, that there is much similarity in the means necessary for the removal of such diseases; the parade of classification under such circumstances, although it may serve to display the fancy of an author, can have no effect either in rendering the study of Surgery more easy, or the practice of it more attainable.

Yet

Yet when one subject is naturally connected with another, I shall not anywhere attempt to separate them; and when the description of any operation can be more easily understood from what has been said concerning another, I shall consider them in immediate succession: But, in other instances, where no connection can be traced between the different articles treated of, no methodical arrangement can be with advantage attempted.

Were I to endeavour to trace the successive improvements which have been made in surgery within these last fifty or sixty years, I should often find it difficult, and sometimes impossible, to determine by whom the practice, as it is now established, was introduced; and in order to give a fair account of the progress of the different operations of surgery, from their rude to their improved state, I should be under the necessity of entering into a full chronological history of each. While inquiries of this kind could serve no useful purpose, they would tend to render more prolix, a work which, from the variety of its subjects, must necessarily extend to a great length, I shall therefore in general decline them. On some occasions, however, when the author of any remarkable improvement is known with certainty, I shall not fail to give him all the credit which his discovery seems to merit.

Such

Such of my readers as are fond of theoretical disquisitions, will, I am afraid, be frequently disappointed. When the subject under consideration can be rendered more clear and intelligible by it, I have occasionally employed such reasoning as experience and common sense seem evidently to support; but I have every where studiously guarded against entering on the discussion of doubtful and speculative opinions.

In considering the different subjects, the appearance or symptoms of the disorder—the usual causes known to induce it—its probable consequences—and the best method of treatment—are particularly described in succession: and when an operation of importance is to take place, the parts which lie contiguous, but which the operator ought to avoid, are pointed out, as well as those which he is under a necessity of dividing.

In describing the different operations, I have uniformly adhered to the method at present practised by the best surgeons, excepting in such instances where improvements of my own are proposed; and none of these are any where recommended, the utility of which has not been ascertained by repeated trials.

In a work of this nature, it must unavoidably happen, that on several occasions I differ in opinion from various respectable authors; but

where

wherever I do so, no other motive, I hope, will appear for it, than a wish to render more perfect an art which I am attempting to describe and illustrate.

I am fully aware of the difficulties to be encountered in carrying on and completing this design; and am so diffident of my abilities to do justice to the undertaking, that, even after a considerable part of the materials are prepared, I have chosen this mode of publishing it in separate volumes, that I may thereby have an opportunity of discovering the sentiments of the public with regard to its merit and utility; a circumstance, by which I will be in a great measure determined in the farther execution of my plan.

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A
T R E A T I S E
O N T H E
THEORY AND PRACTICE
O F
S U R G E R Y.

CHAPTER I.

Of Sutures.

SECTION I.

Of Sutures in general.

AS sutures of one kind or another are found necessary, not only in every large wound, but in almost every operation of importance, the consideration of

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this

this subject seems first to require our attention.

A variety of sutures have been practised by surgeons, each of which has from long experience been applied to a particular purpose, viz. The interrupted suture; the quilled suture; the glover's and the twisted suture. Many others are enumerated by ancient writers: but the four now mentioned are the only species of sutures at present in ordinary use; and even of these, some, we think, might with propriety be omitted.

The intention of every suture is to unite parts, which either by accident or design have been divided. Another mode of effecting this, is through the intervention of adhesive plasters: and this by surgeons has been termed the false or dry suture; in opposition to the others performed by the needle, which are denominated the true or bloody suture.—But as the consideration of this subject, namely, the use of adhesive plasters in wounds, will be more properly introduced in a subsequent part

part of this work, we shall not in this place enter upon its discussion.

SECTION II.

Of the Interrupted Suture.

IN deep wounds, when a reunion of the divided parts is intended, this is the suture to which we generally have recourse; but from what will be afterwards more fully explained when treating of wounds, and from what will presently farther appear, it does not seem to be so well adapted to this purpose as the twisted suture. When it is determined, however, to make trial of the interrupted suture, the following is the easiest mode of doing it.

In every wound where sutures are found necessary for the retention of parts, it has commonly been considered as good practice, to carry the needle and ligature to the bottom of the sore, so as to give as little room as possible for matter collecting underneath; and the usual mode of effecting this, is by introducing the needle from

without inwards, and again from the bottom of the wound to the same distance on the opposite side. But this suture, it may be remarked, is much more neatly, and at the same time more easily performed, by passing both ends of the thread from within outwards; which is readily done by using two needles upon each thread, instead of one. A needle being put upon each end of the same thread, and each needle being inserted at the bottom of the sore, and pushed outwardly so as to pass out at a proper distance from the edge of the wound, the needles are then to be taken off, and the threads allowed to remain till all the ligatures are passed which the extent of sore seems to require.

The number of ligatures necessary for any wound, must in a great measure depend upon the extent of divided parts. By authors in general it has been laid down as an established rule, that one suture is fully sufficient for every inch of wound. It will frequently indeed happen, that this number is found sufficient; but in some instances,

stances, particularly where muscular parts are deeply cut transversely, and where consequently a great degree of retraction occurs, a greater number of stitches are necessary: Whenever a number of angles, too, occurs in a wound, more ligatures are required than in a straight wound of the same extent; for, at every angle, however inconsiderable it may be, there ought to be a suture.

In passing the ligatures, great care is necessary to pierce the skin at a sufficient distance from the edge of the wound: for if they do not comprehend a thickness of parts in some measure proportioned to the depth of the wound, and to the extent of retraction which may be expected, they will very readily cut through the parts entirely.—By some authors we are directed to enter the ligatures, at a distance from the edges of the sore nearly equal to the depth of the wound. This rule, however, will by no means be found to answer in practice. Thus, in a very deep wound, for instance, of about three inches, no necessity can oc-

cur for carrying the ligatures three inches from the edges of the sore ; and again, in very superficial cuts, it sometimes happens that the ligature ought to be passed out at a distance from the edges of the wound greater than its depth. It ought not, in almost any case, to be less than half an inch from the edge of the sore ; and it will seldom happen, even in the largest wounds, that an inch is not found to be a sufficient distance.

It will be readily understood, that the strength of the ligature and size of the needle ought always to be proportioned to the depth of the sore and retraction of parts. The several sizes of needles represented in plate I. are such as have been found necessary in practice ; and the ligatures to be used along with them ought to be such as nearly, though not entirely, to fill the eyes of the different needles. In order to make the ligatures pass more easily, to render them more durable, and at the same time to make them more susceptible of a flattened form, which does

Plate I.

Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



U. Bitterwurzel



does not so readily cut through the contained parts as a round one, they ought all to be well covered with fine bees-wax.

As soon as the threads are all passed, the lips of the wound ought to be pressed together and supported by an assistant till all the ligatures are firmly tied ; beginning either in the middle of the wound, or at one end, as the operator inclines. In tying the knots, it is usual to pass the ends of the threads twice through the first noose, in order to prevent their yielding ; and when this is done, it is alledged by some that there is no necessity for more than one knot upon each ligature ; but as two knots are very easily made, and as every chance of their yielding is thereby effectually prevented, this precaution ought never to be omitted. It is a practice with some surgeons, to insert a piece of lint between the first and second knots, or between the first knot and the skin below, in order to save the parts underneath from the pressure of the knots ; but as in reality all

such means of protection afford no advantage of importance, and as they prevent the knots from being made with exactness, they ought therefore to be laid entirely aside.

By some writers on this subject, we are desired not to bring the knots of ligatures immediately upon the edges of the wound, but rather to carry them to one side, over upon the sound teguments: but whoever has tried both methods, will at once be sensible, that this is by no means an improvement; for in no way can both sides of the sore be equally supported, but by the knots being passed immediately above the lips of the divided parts.

S E C T I O N III.

Of the Quilled Suture.

AS the quilled suture is still employed by some practitioners, it is here thought necessary to describe the mode of performing it.

In deep wounds attended with much retraction, it is always a necessary precaution,

tion, to assist the operation of the ligatures, by means of bandages so applied as to afford as much support as possible to the divided parts: But, even with every assistance of this nature, it now and then happens, that the divided parts cannot be kept together, retraction occurs to a greater or lesser degree, and the ligatures of course cut affunder the soft parts they were at first made to surround.

With a view to prevent this receding of the teguments and other parts, it was long ago proposed to add to the interrupted suture what was supposed would afford an additional support, viz. quills, or pieces of plaster rolled up into the form of quills; one of which being placed on each side of the wound, the doubling of the ligature is made to include the one, and the knot to press directly upon the other, instead of being made immediately on the edges of the sore, as was directed for interrupted sutures.

It is at once evident, however, that the ligatures must here make the same degree
of

of pressure on the parts through which they pass, as they do in the interrupted suture; and this being the case, it is equally obvious, that the interposition of these substances cannot be of any use. This suture is accordingly now very rarely practised, and it is probable that it will be soon laid entirely aside.

SECTION IV.

Of the Glover's Suture.

THIS suture receives its name from being that which the glovers commonly use. As it is exceedingly simple, and very universally known, it does not here require a particular description: We shall therefore just shortly observe, that it consists in a series of stitches all connected with one another, and continued in an oblique spiral direction along the course of the divided parts intended to be kept together.

This suture has hitherto been universally employed for reuniting such parts of the

the intestines as have been divided by wounds: but, when treating of accidents of this kind, I shall endeavour to show, that the same end may be more perfectly attained, and probably with less danger, by means of the interrupted suture; so that as this suture has almost never been applied to any other purpose, it will likewise in all probability soon fall into disuse.

SECTION V.

Of the Twisted Suture.

BY the term Twisted Suture is meant, that species of ligature, by which parts, either naturally or artificially separated, are united together, by means of strong threads properly twisted round pins or needles pushed through the edges of the divided parts.

This suture is commonly employed for the purpose of uniting the parts in cases of hare-lip; and this indeed is almost the only use to which it has been hitherto applied:

But

But we may here remark, that it may with great advantage be put in practice in a variety of other cases, particularly in all artificial or accidental divisions either of the lips or cheeks ; and, in every wound in other parts that does not run deep and in which sutures are necessary, this suture is preferable to the interrupted or any other.

In very deep wounds, for instance in all wounds extending to a greater depth than an inch and a half, the interrupted suture is the only one that is admissible ; for, in all such deep cuts, the pins necessary in the twisted suture cannot with propriety be employed, as they cannot be introduced to such a depth, and afterwards so twisted with ligatures as to reunite the divided parts, without great pain to the patient. In such wounds, therefore, we must of necessity have recourse to the interrupted suture. But it may be here remarked, that wounds of this depth requiring the aid of sutures, are very rarely met with : so that, in by much the greatest proportion of wounds where sutures are advisable, the

twisted

twisted future will be found practicable ; and whenever it is so, it ought certainly to be preferred to every other, as being obviously better calculated, even than the interrupted future, for the retention of divided parts. The pins made use of for twisting the threads upon, ought to be made of a flat form, so as not to cut the parts through which they pass, so readily as the ligatures employed in the interrupted future : And thus one great objection to the latter is very effectually obviated ; for, every practitioner must be sensible of this being the greatest inconvenience attending the interrupted future, that when muscular parts are divided, so as to produce much retraction, the ligatures employed for retaining them, almost constantly cut them through before a reunion is accomplished ; whereas, the flatness of the pins used in the twisted future, and upon which, it may be remarked, the whole pressure produced by the ligatures is made to rest, proves in general a very effectual preventative against this occurrence.

The

The pins used in this operation have commonly been made of silver ; and, in order to make them pass with greater ease, steel points have been added to them. As gold pins, however, are capable of receiving a sufficient degree of sharpness, which renders the intervention of steel points quite unnecessary ; and as gold is more cleanly than silver, from its not acquiring so readily that kind of crust which immersion in fluids is apt to produce upon the other ; pins of this metal are therefore preferable.

The form and size of pins represented in Plate II. are what experience has shown to be the most useful for every ordinary purpose ; but, for particular uses, the size must no doubt be subject to variations.

The manner of performing this operation is as follows : The divided parts intended to be reunited, must by the hands of an assistant be brought nearly into contact ; leaving just as much space between the edges of the sore, as to allow the surgeon

geon to see that the pins are carried to a proper depth. This being done, one of the pins must be introduced through both sides of the wound, by entering it on one side externally, pushing it forwards and inwards to within a little of the bottom of the wound, and afterwards carrying it outwardly through the opposite side, to the same distance from the edge of the sore that it was made to enter at on the other.

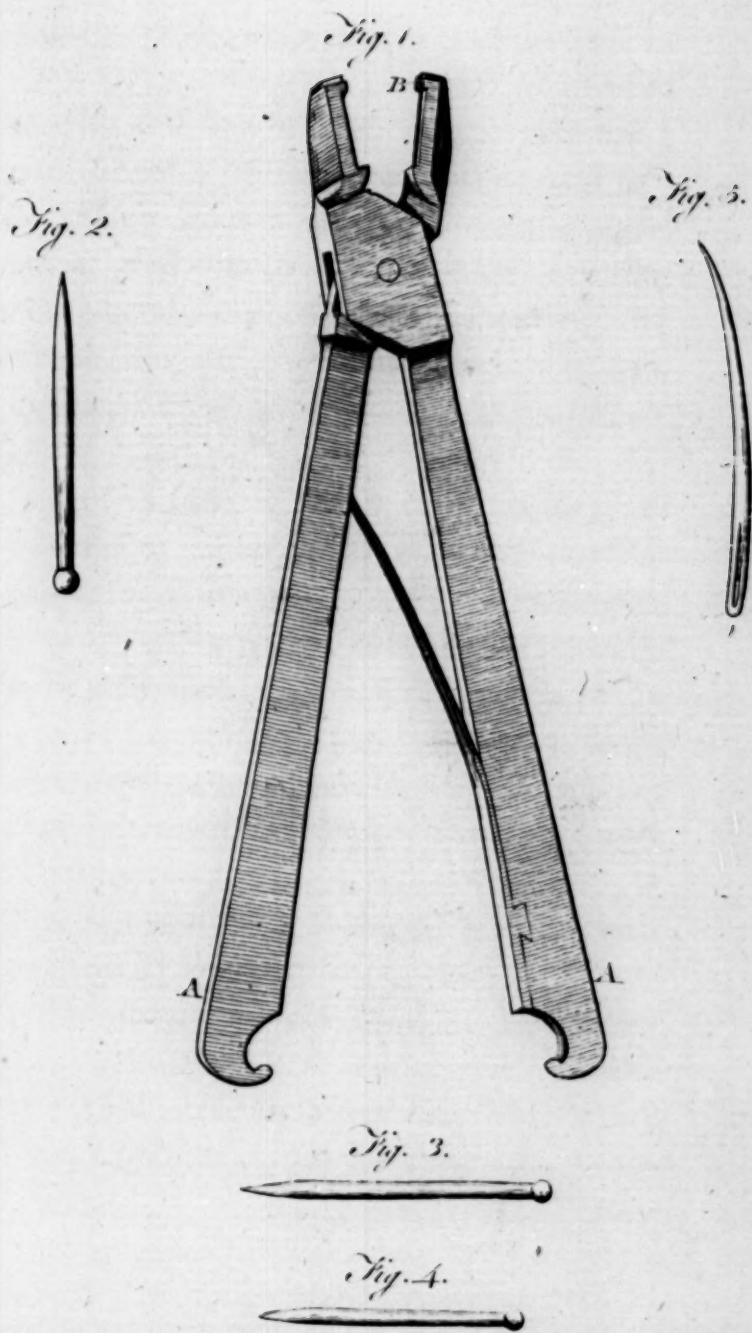
The distance at which the needle ought to enter from the edge of the sore, must be determined by the depth of the wound, and by the degree of retraction produced in the divided parts. In general, however, it is a proper rule in deep wounds, to carry the pins to a distance from the edges of the sore, nearly the same with the depth to which they penetrate: And it may be also remarked, that, whatever the deepness of the wound may be, the pins ought to pass within a very little of its bottom; otherwise the parts which lie deep will run a risk of not being united; a circumstance
which

which will frequently give rise to troublesome collections of matter.

In passing the pins through the different sides of the wound, if the skin and other teguments are not more firm than ordinary, it may commonly be done by the fingers alone, and particularly if the pins are made with small heads or knobs for the fingers to press upon; but when firmness of parts and other circumstances render the entrance of the pins difficult, the instrument termed Porteaiguille very effectually removes this inconvenience.—In Plate II. is represented the most convenient form of this instrument that has yet been invented.

The first pin being passed in this manner very near to one end of the sore, and the parts being still supported by an assistant, the surgeon, by means of a firm waxed ligature passed three or four times round and across the pin, so as nearly to describe the figure of 8, is to draw the parts through which it has passed into close contact; and the thread being now secured

Plate II.



J. M. Miller.



secured with a loose knot, another pin must be introduced in the same manner at a proper distance from the former; and the thread with which the other was fixed, being loosed, and in the same manner carried round this pin, others must be introduced at proper distances along the whole course of the wound, and the same ligature ought to be of a sufficient length for securing the whole.

The number of pins to be used, must be determined entirely by the extent of the wound. Whenever the suture, however, is practised, whether the wound be large or of very small extent, a pin ought to be introduced very near to each end of it, otherwise the extremities of the sore are apt to separate so as not to be afterwards easily reunited. In large wounds, if the pins be introduced at the distance of three quarters of an inch from one another, it will in general be found sufficient; but, in cuts of smaller extent, a greater number of pins become necessary in proportion to the dimensions of the sores.

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Thus,

Thus, in a wound of an inch and half in length, three pins are absolutely requisite; one near to each end, and another in the middle of the sore: Whereas, five pins will always be found fully sufficient for a wound of three inches and a half in extent, allowing one to be within a quarter of an inch of each extremity of the wound, and the others to be placed along the course of the sore at the distance of three quarters of an inch from one another.

The pins being all introduced and secured in the manner directed, nothing remains to be done, but to apply a piece of lint wet with mucilage, all along the course of the wound, with a view to exclude the external air as effectually as possible.

In order to prevent the ends of the pins from preffing upon and hurting the skin below, it is usual to apply a small bolster of linen or charpie under each of them; but as this always does mischief, by tending to press upon the pins, so as to force them to act upon the soft parts thro' which they

they have passed, every thing of this kind ought to be omitted. When, however, the patient happens to complain of being hurt by the ends of the pins, this may be easily prevented by introducing between them and the skin pieces of thin linen spread with any adhesive plaster.

In order to give every chance of success to this operation, it has been commonly advised, immediately after the pins are secured, to apply the uniting bandage over the whole, so as to afford as much support as possible to the contiguous parts. The least reflection, however, renders it evident, that every degree of pressure made in this manner must do mischief; for, the bandage being made to rest immediately upon the pins, a considerable degree of pain and consequent inflammation must of course be produced by it: And in fact this is so much the case, that, in every instance in which I have seen this bandage applied, it either did harm, by exciting inflammation in consequence of too much pressure upon the pins; or, if that effect was not pro-

duced, no advantage was received from it, from the bandage not being applied with such tightness as to afford any support whatever to the parts below.

The next point to be determined, is, the time the pins should be allowed to remain. When they remain long, they generally do harm, by the unnecessary irritation and consequent retraction of parts with which they are always attended; and again, if they are not continued for a sufficient length of time, that degree of adhesion is not produced between the divided parts that is necessary for their future retention, so that the effect of the operation comes to be in a great measure, if not entirely, lost.

In wounds of no great depth, for instance of about three quarters of an inch, a sufficient degree of adhesion always takes place in the space of five days; and six, or at most seven days, will generally be found sufficient for wounds of the greatest depth.

But with respect to this circumstance, it must always be understood, that the patient's

tient's state of health will have a considerable influence on the time necessary for producing adhesion between divided parts. In specifying the time required for this purpose, the operation is supposed to have been done in a sound and healthy state of the constitution. When the patient labours under any disorder which affects the general system, by cutaneous eruptions or otherwise, it is impossible to ascertain this circumstance with precision: In such cases we must be determined by the nature and state of the disease present at the time.

As soon as the pins are withdrawn, the uniting bandage may be applied with great advantage in order to serve as a support to the parts newly united; but, as slips of leather spread with ordinary glue, when applied to each side of the cicatrix, may, by means of ligatures properly connected with them, be made to answer this purpose in a more effectual manner, this mode of supporting the parts ought of course to be preferred.

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As the twisted suture when properly performed is a very neat operation, as its consequences are in general of importance, and as it may with much advantage be made to supersede the use of almost every other suture, a few instances only excepted, I have therefore thought it proper to consider it with more attention than has hitherto been commonly bestowed upon it.

C H A P. II.

Of the LIGATURE of ARTERIES, and other means employed by art for putting a stop to HEMORRHAGIES.

IN every species of wound, whether accidentally produced, or effected by the hands of a surgeon, the first circumstance to be attended to, is the degree of hemorrhagy that takes place. In all such occurrences, the blood is discharged, either from

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one or more large arteries; or, is produced by a general oozing from the smaller vessels over the surface of the sore: To the former of these causes we shall first attend, and shall afterwards proceed to the consideration of the latter.

A surgeon being called to a person losing much blood from the division of any of the larger vessels, the first step to be taken, is, by means of strong compression, to effect a temporary stoppage of the discharge, till by the application of ligatures a more effectual remedy is obtained. In the head, as well as in the trunk of the body, the easiest method of applying pressure of this kind, is, by means of dossils of lint or of soft linen, held firmly upon the mouths of the bleeding vessels, either by the hands of an assistant, or by the use of a proper bandage: Or, when pressure can be effectually applied to the superior part of the artery, it answers better; as it not only secures the vessel equally well, but admits of the necessary ligature being applied with greater freedom.

When, again, accidents of this nature occur in any of the extremities, and where pressure can be made with ease on the superior parts of arteries, for such cases we are in possession of a remedy, which, when skilfully applied, never fails to put an immediate stop to all farther loss of blood. What is here meant, is, the Tourniquet.

Till the invention of this instrument, which was not known before the last century, Surgery remained extremely defective indeed. No operation of importance could be undertaken on any of the extremities but with great hazard to the patient; and the effects of large wounds must frequently have proved mortal, from the want of this assistance, which otherwise might not have been in any degree hazardous.

As the invention of the tourniquet is claimed by different persons, and even by different nations, we shall not here pretend to say from whence it originally came: but whoever had the merit of it, the first instrument of this kind with which the world was made acquainted, was exceedingly simple;

simple; so much so, indeed, that it now appears very surprising that the discovery should have been left for such a late period. A small cushion being placed upon the course of the principal artery of a limb, a circular rope or bandage was made to pass twice round it; and a small wooden handle being then introduced between one of the folds of the bandage, for the purpose of twisting it, the cushion by these means was pressed with so much force upon the artery, as to put an effectual stop to the course of the blood through the under part of the limb.

Mr Petit, an eminent surgeon of Paris, was the first who proposed a considerable improvement on this instrument, by connecting the circular bandage with a screw, which was so contrived as to produce the pressure chiefly on the principal arteries, without materially affecting the rest of the limb. It had this advantage over the other instrument, that the operator himself could manage it, without being under the necessity

sity of employing an assistant; but it was liable to one great inconvenience from the very circumstance which by the inventor was considered as an improvement. This instrument of Mr Petit being made to act upon the principal arteries only, the smaller vessels communicating with these, by not being properly compressed, discharge blood freely from the instant they are cut; and as this proves a very troublesome circumstance in the course of operations, different improvements have of late been made upon it. The pattern in Plate III. is the result of all these.

By means of this instrument in its now improved state, the blood in any limb is very easily and effectually commanded; and as it grasps the whole member equally, all the collateral branches as well as the principal arteries are equally compressed by it. It has this material advantage, too, over every other instrument of this kind, that, when properly applied, a single turn, or even half a turn of the screw, is sufficient for producing either a flow of blood, or

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Plate III.

Fig. 1.

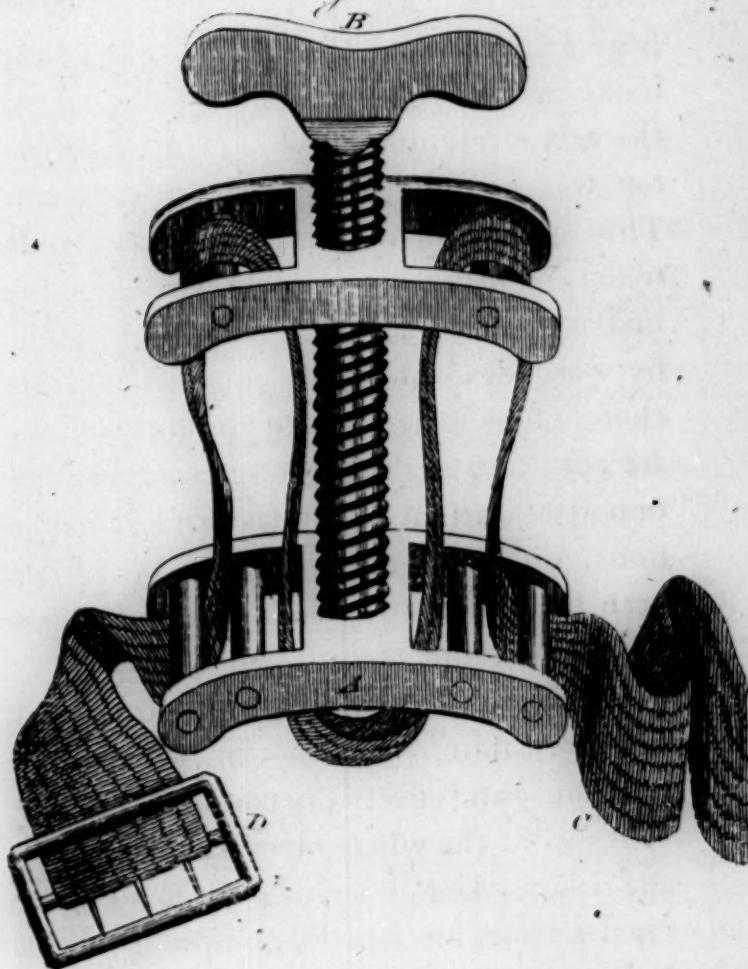


Fig. 2.



A. Bell sculpt.



for putting a total stop to it.—The manner of using it is this.

Let a cushion of three inches in length by one inch and half in diameter, be prepared of a linen roller, and be made tolerably firm, but yet not so hard as to render the pressure produced by it very painful: This being placed upon the course of the principal artery of the limb, is to be firmly secured in that situation by one or two turns of a circular roller, of the same breadth with the cushion itself.

The instrument A, with the strap connected with it, being now placed upon the limb, with the handle of the screw B on the side of the member opposite to the cushion upon the artery, the strap C is to be carried round the limb directly over the cushion, and to be firmly connected on the other side to the buckle D. In thus connecting the strap and buckle together, particular attention is necessary in doing it with great firmness, so that the screw may afterwards operate with as much advantage as possible, in producing a sufficient degree of pressure.

pressure. When proper attention is paid to this circumstance, a single turn of the screw, as we have said, proves sufficient for putting an entire stop to the circulation of blood in the limb: but when the strap has not at first been made very tight, several turns of the screw become necessary; an occurrence which may be always easily prevented, and which, when not attended to, proves often very embarrassing in the course of an operation.

Whenever it is determined, therefore, that any farther loss of blood from a divided artery is to be prevented, pressure on the superior part of the vessel ought to be immediately applied by the hands of an assistant, or a proper bandage, when the cut is on the head or trunk of the body; and by means of the tourniquet, when any of the extremities are wounded.

The patient being in this manner secured from immediate danger, the practitioner must now proceed to the easiest and most effectual mode of preventing a return of hemorrhagy

hemorrhagy on the removal of the tourniquet.

The ancients, as we have seen, were ignorant of the use and application of the tourniquet, and they were equally deficient in the employment of means for giving a permanent security against the flow of blood from divided vessels: It will therefore readily occur to every modern practitioner, that in this imperfect state of Chirurgical knowledge, when any capital operations were attempted, they must have run a much greater risk of doing mischief, than of procuring any advantage to their patients. To the smaller vessels they applied dossils of linen covered with astrin-gent powders; and for the larger arteries, searing with hot irons was their only re-source.

Of this last remedy, however, although it commands a temporary stoppage of the blood in every case of hemorrhagy, the effects are by no means to be depended on: for, in general, the pulsation of the larger arteries very soon overcomes all the resist-

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ance produced by the application of the cautery.

In ancient times, however, when this was the most effectual remedy with which the world was acquainted, practitioners were under the necessity of having recourse to it; and, at that period, it is not surprising to find them exercising their genius in inventing a variety of styptic applications: But since surgery became enriched with that material improvement of securing the larger arteries by means of ligatures, a practice easily effected, and with very little pain to the patient, it is surprising to find that remedies of this kind are still searched after. If the use of ligatures were in itself attended with much difficulty, if by experience it had been found to be productive of many bad consequences, or, if it had been frequently known to fail in answering as a full security against the hemorrhagies of the larger arteries; in any of these events, it ought to be the business of practitioners to endeavour to procure a more effectual remedy. But, as the ligature of arteries is
very

very simple in its nature ; as the pain arising from it is trifling ; as few instances occur of any thing bad being produced by it ; and especially as, when properly performed, it never fails of proving a sure preventative against all loss of blood from the larger arteries ; there can be no good reason for anxiously seeking after other remedies.

Agaric and other fungous substances have been much extolled for their styptic powers ; and chalybeate solutions, as well as all the variety of mineral acids, have in different forms been held forth to the public as effectual remedies of this nature ; not only as nostrums by those of less liberal principles, but, what is more surprising, in some instances by practitioners of character.

With the former class of men this happens as a common occurrence in the course of their profession, and is therefore to be expected ; but a perseverance in quest of any new remedy of this kind on the part of Surgeons of reputation, who are already well acquainted with the effects of ligatures

tures in cases of hemorrhagy, and who also know that the practice is seldom attended with bad consequences, must proceed from a degree of nicety and refinement, which may create much trouble to themselves, and which in all probability can never be productive of any practical advantage.

We shall therefore venture to lay it down as an established maxim in surgery, That in every case of hemorrhagy from any of the larger arteries, no styptic application whatever ought to be trusted to, the ligature being the only remedy to be depended on. We now proceed therefore to the consideration of the easiest and most effectual mode of carrying this application into execution.

Various methods have been invented for securing arteries by means of ligatures. The practice now in ordinary use, is, by means of a curved needle, to pass a ligature of sufficient strength round the mouth of the bleeding vessel, including a quarter of an inch all round of the contiguous parts*, and

* Sharp's Surgery—On Amputation.

and afterwards to form a knot of a proper tightness upon the vessel and other parts comprehended in the noose.

One great objection, however, to this method is, that the nerves accompanying the blood-vessels, together with a considerable portion of the muscular substance through which they pass, must always be surrounded with every ligature formed in this manner. From this circumstance much more pain is produced than is necessary, by the nerves and other parts being at the same time compressed with the arteries; and, on some occasions, the same cause has evidently given rise to violent convulsive affections, not only of the part chiefly affected, but of the whole system.

Spasmodic twitches are frequently found to occur after the amputation of limbs, and are often the source of much distress. In some instances they are no doubt to be considered as the effect of other causes; but in various cases it has happened, that demonstrative proof has been obtained of their arising from the ligatures of arteries

applied in an improper manner. When such convulsive affections occur after amputations, and the usual means of preventing them are found to fail, effectual relief may be frequently obtained by destroying the ligatures altogether, so as to remove the compression upon the nerves; care being taken at the same time to renew the ligatures upon the arteries immediately, without comprehending any of the contiguous parts.

Thus, it is not to the simple ligature of vessels, but to the improper manner in which the operation is performed, that is, the including of nerves and other parts, instead of tying the arteries alone, that the bad symptoms occurring in such cases are to be attributed.

Practitioners have commonly been afraid of tying up blood-vessels by themselves without the intervention of some of the surrounding parts, on this supposition, that the coats of arteries are not of sufficient firmness to bear that degree of compression

sion necessary for the prevention of hemorrhagy.

This, however, originates from an idea that the coats of arteries are not so strong as they really are; and that a great degree of force is necessary for compressing their sides into close contact with one another.

But it is now well known, that even very small arteries are possessed of much firmness; and it is also certain, that even in the largest arteries of the arm or thigh, a very slight degree of compression is fully sufficient, not only for restraining hemorrhagy, but for securing the ligature on the very spot to which it is first applied: And in small vessels the force necessary for this purpose is trifling indeed; being far less than is commonly applied.

Although the circumstance we are now insisting upon may not at first sight seem to be of much importance, yet in fact it merits very particular attention. Even of itself it is a matter of no small consequence; but it is the more material when

we consider it as connected in many instances with circumstances on which the life of a patient may in a great measure depend; and we know well too, that success in surgical operations depends more on a minute attention to every circumstance relating to them, than on particular dexterity in any one part of them.

It has also been objected to this mode of securing blood-vessels by themselves, that the ligatures, although they should not cut the arteries through, yet that they are more apt to slip than when some of the surrounding parts are comprehended along with them; and, in some instances, it is said that arteries retract so far, that they cannot in any other way be laid hold of, than by means of the crooked needle in the ordinary method.

Long and repeated experience, however, of a few individuals, in regard to this mode of taking up arteries by themselves, has put the fact beyond a doubt, that it is as secure as any other yet invented *.—

Fatal

* See an essay upon this subject, by the ingenious Mr Aitken, surgeon in Warrington.

Chap. II. *of Arteries, &c.*



Fatal hemorrhagies after capital operations, either from inattention, or some other cause, do now and then indeed happen in the hands of the most able practitioners; but occurrences of this nature have as frequently happened when the curved needle was employed, as when the blood-vessels were secured by themselves without any of the contiguous parts being included.

From the result of my own experience, indeed, I should be induced even from this consideration, to draw a conclusion in favour of the method we have been endeavouring to recommend. For, in the course of practice, both among hospital-patients and in private, I have known different deaths occur from the bleeding of stumps after the amputation of members: Whether this proceeded from the ligatures having slipped from some of the arteries; or from this circumstance, that some of the vessels which did not appear during the operation, had been of course passed over without being observed and had afterwards burst out,

I shall not pretend to determine: but in all of these, *the crooked needle only* had been used during the operation; and it has so happened, that I never met with a single instance of a similar occurrence where the arteries were secured by themselves by means of the tenaculum; an instrument to be afterwards taken notice of.

In a few instances it may happen, that a bleeding vessel, from lying at the bottom of a deep wound, cannot be laid hold of in any other manner than by the curved needle being made to pass round it. Such occurrences, however, are exceedingly rare: insomuch that I have seldom known an instance in which hemorrhagy could not be as effectually restrained by the mode now to be pointed out, as by the use of the crooked needle.

In all operations whatever, to save unnecessary pain ought to be a very capital object. In every business of this kind, the object in view ought no doubt to be attained in the most complete manner; but that mode of operation, which is as complete

plete as any other, at the same time that it is the least painful to the patient, is undoubtedly in every instance to be preferred. Now, with respect to the point in question, as we have already clearly shown, that arteries may be tied with as much safety in every respect, by themselves, as when connected with any of the neighbouring parts, the difference of pain produced by the two modes of operating, ought at once to determine in favour of the former.

When any of the contiguous parts, particularly when the nerves which generally accompany the blood-vessels, are included in the same ligature with an artery, which when the curved needle is employed is a circumstance scarcely to be avoided, every practitioner knows that tying the knot in this manner is frequently complained of by the patient in very severe terms. I have on many occasions known patients who have borne the amputation of limbs, and of cancerous breasts, without shrinking, complain bitterly of the severe pain

produced by the method of securing arteries with the crooked needle. And on the contrary, the pain attending the method now proposed, is so trifling, that, when properly done, even the most timid patients very seldom complain of it.

For some time after I first began to use the tenaculum, curiosity induced me, on different occasions, to put the matter under consideration to the test of experiment: And to render the trial as fair and decisive as possible, it was always made upon the same subject, under the same operation. Different vessels were secured in the ordinary manner by the crooked needle; whilst others were laid hold of by the tenaculum: But so great was the difference in point of pain, that the one was uniformly allowed to give very little uneasiness: whereas it frequently happened, that the other was complained of as the most painful part of the whole operation.

Among other advantages which the tying of arteries by means of the tenaculum has

has over the old mode of operating, there is still one we have not yet taken notice of. It often happens after amputations, and other operations where the larger arteries have been tied, that the ligatures do not come easily away, from being made to run so deep as with the curved needle is commonly necessary. In some instances much pain and trouble has occurred from this circumstance, the ligature remaining quite immovable for a great many weeks: And after all, I have seen it necessary for the surgeon, to put the patient to a great deal of pain, by being obliged to cut out the threads with a scalpel. But when the tenaculum is used, every risk of this kind is avoided, from the ligatures generally dropping of their own accord, in the course of the third or fourth dressing of the sore.

From what has been said, therefore, we shall consider it as a practice that ought to be established, that in forming the ligature of arteries, the nerves and other contiguous parts should be carefully avoided.

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For the purpose of effecting this with ease and safety, various kinds of the instrument termed a Forceps have been invented; with these, the arteries of a sore are laid hold of and pulled out, so as to admit of the application of ligatures.

For the larger blood-vessels, the forceps has been found to answer conveniently enough; but, in the smaller arteries, they are by no means so fit for the purpose as the instrument or hook I have been recommending, termed a Tenaculum, and represented in Plate I. And as a hook of this form answers equally well in the larger arteries likewise, the use of the forceps may therefore be laid entirely aside. The manner of using the tenaculum is this.

In order to detect the arteries to be tied, the tourniquet with which they are secured, must be slackened a little by a turn or two of the screw; and the moment the largest artery of the sore is discovered, the surgeon fixes his eye upon it, and immediately restrains the blood again by means of the tourniquet. An assistant

now

now forms a noose on the ligature to be made use of; and this noose being placed immediately over the end of the artery, so as to include it with certainty, the operator then pushes the sharp point of the tenaculum through the sides of the vessel, and at the same time pulls so much of it out, over the surface of the surrounding parts, as he thinks sufficient to be included in the knot which the assistant is now to make. In forming this ligature, the surgeon's knot, as it is termed, which consists in passing the thread twice through the first noose, is certainly preferable to every other, from its being less liable to yield or slip. And as some additional security is obtained by forming a second knot above the first, this precaution ought never to be omitted. It is easily done; and on security in this point the patient's life may in a great measure depend.

The degree of strength of the ligature must always be proportioned to the size of the vessels; but this is a circumstance to be at all times determined by the judgement
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of the practitioner, as must also the force to be employed in forming the knots. To what was already said upon this point I shall just add, that a very small force is fully sufficient for securing even the largest arteries: and that, after such a force has been applied as evidently restrains the farther loss of blood, a very trifling additional compression is all that is necessary.

The principal artery being in this manner secured, all the vessels of the part must one after another be taken up in the same manner, by first loosening the tourniquet in order to discover them, and afterwards applying the ligature to each in the manner directed.

It often happens, however, that the loss of blood the patient has sustained; a tendency to deliquium which may take place for the time; the fear he labours under; and the degree of cold to which the sore is exposed, have all together such an effect upon the smaller arteries, as to prevent them for the time from discharging their contents; and as arteries left in such a state without being

being secured, generally burst out on the removal of these causes, a circumstance which always occasions much trouble to the practitioner, as well as a great deal of pain and risk to the patient, every surgeon ought to pay the nicest attention to this point.

The tourniquet should be made perfectly loose; any coagulated blood on the surface of the sore ought to be carefully washed off with a sponge and warm water; and the patient, if faintish, ought to get a glass of wine, or some other cordial; and after all, the surgeon ought to examine, with the most minute attention, the usual course which the vessels of the part are known to take.

This being done, every artery of the part, even the smallest that can be distinguished, ought to be secured with a ligature: For such vessels as appear exceedingly trifling while the part is yet exposed to the air, nay even the small branches of arteries that happen to be neglected, will be capable of discharging very considerable

able quantities of blood after the patient becomes warm in bed, when the solids are thereby relaxed and the fluids expanded; and, as little or no injury can ever be done by the proper application of ligatures to all the arteries that present themselves, the greatest attention ought at all times to be paid to this circumstance.

I have insisted the more on this, from having frequently observed much uneasiness and distress produced by a want of proper attention to this part of an operation.

When the principal arteries of a stump have been taken up, and a little blood continues to be discharged, but appears to come from a few small vessels only, the surgeon, unless he is much accustomed to occurrences of this nature, is induced to think, that as they are very trifling to appearance, so he need not be at the trouble of tying them, as the necessary compression of the bandages proper for the wound will in all probability effect a total stoppage of the

the hemorrhagy. In a general oozing of a small quantity of blood from the whole surface of a sore, and when no particular vessel can be distinguished, there is a necessity for trusting to this remedy; but whenever an artery can be discovered, of whatever size it may be, it ought unquestionably to be secured by a ligature. It very rarely happens that any inconvenience occurs from ligatures when properly applied; but many lives have been lost from a remissness in this article. I have known different instances of this, and the same must have occurred to others.

When, from the deepnes of a wound, or from any other cause, some particular artery cannot be properly secured by the tenaculum; in this case we are under the necessity of employing the crooked needle, and the following is the mode of using it.

The operator ought to be provided with needles of various sizes, and of different forms. The needles in ordinary use, are for many purposes quite too much crooked; for, in general, they are more easily managed

naged when their curvatures are not so considerable.

The same kinds of needles that are found necessary for the interrupted suture, as represented in Plate I. answer equally well for the ligature of arteries.

The needles in common use are made triangular with three edges, one on each side, and a third on the concave part of the needle. There is no real necessity, however, for more than two: Indeed the needle enters more easily with two than with three edges; and as the third edge on the concave side, renders them more liable to injure arteries and other parts in the course of their introduction, this addition ought to be omitted.

A needle of this shape, armed with a ligature of a size proportioned to itself and to the vessel to be taken up, is to be introduced at the distance of a sixth or eighth part of an inch from the artery, and pushed to a depth sufficient for retaining it, at the same time that it is carried fully one-half round the blood-vessel. It must now
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be drawn out; and being again pushed forward till it has completely encircled the mouth of the artery, it is then to be pulled out, and a knot to be tied of a sufficient firmness, as was already directed when the tenaculum is used.

In this manner, either by the use of the crooked needle, or of the tenaculum, every hemorrhagy depending upon a division of one or more large arteries, may in general be very easily restrained; but it frequently happens, that considerable quantities of blood are discharged, not from any particular vessel, but from all the small arteries over the surface of the sore. In wounds of great extent, particularly after the extirpation of cancerous breasts, and in other operations where extensive sores are left, this species of hemorrhagy often proves very troublesome from being exceedingly difficult to suppress.

Bleedings of this kind seem evidently to proceed from two very different and opposite causes; a circumstance which, in the

treatment of them, is a matter requiring very particular attention.

FIRST, We now and then find effusions of this nature occurring in strong robust people, where they evidently proceed, either from too great a quantity of blood contained in the vessels, or from an excess of tone in the vessels themselves ; or, perhaps, from a combination of both these causes. But, SECONDLY, Such evacuations undoubtedly happen most frequently in constitutions quite the reverse of the former, viz. in such as are very relaxed and debilitated ; either from a putrid dissolved state of the blood, or from a want of tone in the containing vessels, or in some instances from a concurrence of both.

In constitutions perfectly healthy, when the fluids are not tainted with any degree of putrescency, and the solids are possessed of their natural tonic powers, on the occurrence of wounds even of the most extensive nature, as soon as the larger arteries are secured, all the small vessels that have been divided, in consequence of that

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contractile power with which in a state of health they are endowed, and from the stimulus of the external air to which they are now exposed, are diminished not only in their diameters, but also in their length; in consequence of which, they recede considerably within the surface of the surrounding parts.

This cause of itself would probably in the greatest number of instances prove sufficient for restraining all loss of blood from the smaller arteries; but in the sound state of constitution of which we have now been speaking, another very powerful agent is provided by nature for producing the same effect. From the extremities of the divided vessels which at first discharged red blood only, there now, in their contracted state, oozes out a more thin, though viscid fluid, containing a certain proportion of the coagulable parts of the blood; and this being equally distributed over the surface of the wound, by its balsamic agglutinating powers, has undoubtedly a very

considerable influence in restraining all such hemorrhagies.

In constitutions altogether healthy, where neither of the states of disease we have alluded to preponderates over the other, we find, that, as soon as the larger arteries of wounds are secured, nature, in the manner already described, generally puts a stop to all farther discharge. So that, whenever the contrary happens, by a tedious oozing continuing from the surface of the sore, we ought then to pay particular attention to the habit of body with which it is connected.

When such an occurrence happens in a patient young and vigorous, and where the tone of the muscular fibres is evidently great, the most effectual means of putting a stop to the discharge, is to relax the vascular system, either by opening a vein in some other part, or, what gives still more immediate relief, by untying the ligature on one of the principal arteries of the part, so as to allow it to bleed freely: Those violent spasmodic twitchings too, so frequent

after

after operations on any of the extremities, when they do not depend on a nerve being included in the ligature with the artery are in this manner more effectually relieved than by any other means.

By the same means, the patient, from being in a febrile heat and much confused, soon becomes very tranquil: The violent pulsation of the heart and larger arteries abates, and the blood not being propelled with such impetuosity into the smaller vessels of the part, they are thereby left at more liberty to retract; and as in this state they do not pour forth red blood so freely, they are the more readily covered with that viscid glutinous fluid which we have already shown to be one of the most important means intended by nature for the prevention of such hemorrhagies. At the same time that by the means recommended we endeavour to allay the commotion produced in the system, the patient ought to be kept exceedingly cool; wine and other cordials should be rigidly avoided; cold water, acidulated either with the

mineral or vegetable acids, ought to be the only drink; motion of every kind, particularly of the part affected, should be guarded against; and the wound being gently covered with lint or soft charpie, ought to be tied up with a bandage so applied as to produce a moderate degree of pressure on the extremities of the divided parts.

In every extensive wound attended with hemorrhagies of this kind, and particularly when violent spasmodic affections of the muscles supervene, together with the means already recommended, large doses of opiates are found highly beneficial; for whatever hurtful effects may have been apprehended from opiates in some inflammatory affections, every practitioner who has ventured on a free use of them must admit, that in all occurrences of this nature their influence far surpasses that of any other remedy.

As soon therefore as a sufficient quantity of blood has been discharged, and the wound is dressed and the patient laid to rest,

rest, a dose of opium proportioned to the violence of the symptoms ought to be exhibited. It should be remarked, however, that, in all such circumstances, much larger doses of the remedy are necessary, than in ordinary cases requiring the use of opiates. Small doses, instead of answering any good purpose, seem frequently rather to aggravate the various symptoms; so that, whenever they are here employed, they ought always to be given in quantities sufficient for the intended effect.

Although hemorrhagies of this nature do now and then occur in firm vigorous constitutions; yet they undoubtedly happen much more frequently in relaxed enfeebled habits, where the solids have lost part of their natural firmness, and the fluids have acquired some degree of putrescency. As the vessels in this situation are supposed to have been deprived of that degree of tone of which we wish them to be possessed, instead of restraining the patient from the use of cordials, as is done usually in

every case of hemorrhagy, a moderate use of generous wine ought to be immediately prescribed; for nothing, it may be observed, tends so much in such circumstances to restrain hemorrhagies, as a well-directed use of proper cordials. By tending to invigorate and brace the solids, they thereby enable the arterial system to give a due resistance to the contained fluids; and the same cause, it may be observed, has a considerable influence in restoring to the fluids that viscosity of which in all such instances we suppose them to be deprived.

Whenever, therefore, such tedious hemorrhagies occur in relaxed debilitated habits, a free use of Port, Madeira, or any other wine whose strength and goodness can be depended on, ought to be immediately allowed; a nourishing diet also becomes proper; the patient ought to be kept cool; and the mineral acids, from their known utility in every species of hemorrhagy, ought also to be prescribed. Rest of body is here proper too; and opiates, when indicated either by pain or spasmodic affections

tions of the muscles, ought never to be omitted.

Together with these remedies adapted to the general system, particular dressings, appropriated to the state of the parts to which they are to be applied, have been found very beneficial. We have already remarked, that in firm healthy constitutions, as soon as the discharge of blood which naturally occurs in every large wound is over, the parts come soon to be covered with a viscid coagulable effusion from the mouths of the now retracted arteries; but in constitutions of an opposite nature, where the solids are much relaxed, the blood in general is found in such a dissolved state as to afford no secretion of this nature.

In order therefore to supply as much as possible the deficiency of this natural balsam, different artificial applications have been invented. Dusting the parts with starch or wheat-flour has sometimes been found of use; and I have known gum arabic

arabic in fine powder to answer when these have failed.

Applications of this kind, indeed, have been used with success in all such hemorrhagies, with whatever habit of body they happen to be connected; but they have always proved more particularly serviceable in relaxed constitutions, attended with a dissolved state of the blood and an enfeebled muscular system. We may here use with freedom too, a remedy which in such circumstances generally proves serviceable, but which in constitutions of an opposite nature ought never to be employed. The remedy alluded to is alcohol, or any other ardent spirits, impregnated with as great a quantity as they can dissolve of myrrh or any other of the heating viscid gums. The balsamum traumaticum of the shops, a remedy of this nature, has long been famous for its influence in such cases; but that indiscriminate use of this and similar applications which has long prevailed with some practitioners, I am confident has done much harm; for, as they are all possessed of very stimulating

stimulating powers, they of course tend to aggravate every symptom in wounds connected with a tense state of fibres, when much pain, and especially when spasmodic muscular affections, prevail. But, in constitutions of an opposite nature, where the blood appears to be in a dissolved state, and where the arterial system seems evidently to require a stimulus, remedies of this class come to be very useful: Insomuch that, in every constitution of this kind where hemorrhagies prove troublesome, no application whatever is found to answer better, than charpie immersed in an agglutinating spirituous balsam of this nature.

By a due perseverance in one or other of the plans here pointed out, it will seldom happen that hemorrhagies of this nature are not at last restrained: But when the contrary does occur; when, notwithstanding the use of the remedies recommended, a discharge of blood still continues, together with the means already advised, an equal moderate pressure ought to be applied over the whole surface of the sore, to be

be continued as long as the necessity of the case seems to indicate.

In finishing the dressings of such wounds, after the charpie and compresses have been applied, a bandage ought to be adapted to the part in such a manner as to produce as equal a degree of pressure over the surface of the sore as possible. But it sometimes happens, that no bandage whatever can be so applied as to produce the desired effect; and in such cases, the hand of an assistant is the only resource. In such instances, a person's hand being firmly applied over the dressings, so as to produce a very equal degree of pressure, will commonly succeed when no other remedy is found to have much influence.

Having thus endeavoured to point out the most effectual means of putting a stop to morbid hemorrhages, we shall now proceed to consider the different modes employed by art, for effecting a discharge of blood when indicated by the presence of some disorder in the constitution.

CHAP.

C H A P. III.

Of BLOOD-LETTING.

SECTION I.

Of Blood-letting in general.

BLOOD-LETTING, whether we consider it as to its influence on the system, or with respect to the niceness and even difficulty of the mode usually employed for effecting it, is perhaps one of the most important operations in surgery. From its being so frequently put in practice, and from every pretender to any knowledge in the healing art being able to perform it without any apparent difficulty, the public have been induced to consider it as trivial with respect to its execution; but every practitioner of character must acknowledge, that, in order to perform this operation

operation properly, the greatest nicety, steadiness, and exactness, are necessary. All the other operations in surgery I have frequently seen well performed; but I can with freedom say, that I have seldom seen blood-letting with the lancet done very correctly: When properly performed, it is really a neat operation; but when not done with exactness, it is the very reverse.

It is not here meant to enter into the consideration of the various causes which in different circumstances point out the propriety of abstracting blood from the system; nor is it intended to enter upon a particular discussion of the different effects produced by general and topical blood-letting: These considerations, as being highly important, would of themselves extend to a very great length; and besides, are of such a nature as renders it impossible to enter minutely upon their discussion in any system of surgery. All that is here intended, is to describe as clearly as possible the various modes of performing the operation of blood-letting.

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In all inflammatory affections producing a general disorder of the system, the method of taking away blood as now established by immemorial practice, is, by such means as discharge the quantity to be taken in a short space of time, by an opening made with a lancet, either in an artery or in a vein. Whether there is any real difference in the effects produced by these two modes of discharging blood, it may be difficult to determine with any precision; but there is reason to suppose, that, independent of the quantity taken, the difference is of less importance than is commonly imagined. The latter of these termed Phlebotomy, and the former Arteriotomy, are the means employed for what we term *general* blood-letting; the particular consideration of which we shall presently attend to.

But it often happens, in disorders of an inflammatory nature, where there is evidently a fixed local affection, and where no great degree of fever takes place, that general blood-letting has not much influence

ence in mitigating the symptoms; and in such circumstances considerable advantage is frequently obtained by discharging blood from the part immediately affected, by dividing a number of the small vessels which supply it; and this we term *Topical* or *Local* blood-letting. The means employed by art for discharging blood in this manner shall be afterwards treated of, and we now return to the particular consideration of phlebotomy.

Wherever a vein of a tolerable size can be reached with safety, an opening for the discharge of blood may be made in it with a lancet; but the following are the parts from whence blood is usually taken in this manner; viz. from the veins of the arm at the flexure of the cubitus; from the jugular veins; and from the veins of the ankles and feet. On particular occasions, too, blood is advised to be taken from the veins of the hand, of the tongue, &c.

There are some general rules and observations which relate equally to this operation in whatever part of the body it is practised;

tised; these we shall in the first place point out with as much accuracy as possible, and shall afterwards proceed to treat particularly of blood-letting in the arm and other parts.

I. In this as in every other operation, the situation of the patient, and of the operator likewise, ought to be precisely fixed. As the situation of a patient during the operation of blood-letting, has a considerable influence on the effects produced by the evacuation upon the system, this circumstance therefore merits our particular attention. In some disorders, it is the object of this remedy to evacuate a considerable quantity of blood without inducing fainting: When this is the case, and when from former experience it is known that the patient to be operated upon is liable during the evacuation to fall into a faintish state, a horizontal posture, either upon a bed or on a couch, ought to be preferred to every other; for every practitioner is now well acquainted with this fact, that faint-

ing does not so readily occur in a horizontal as in an erect posture.

It now and then happens, however, that one material advantage expected from the operation of blood-letting, is the inducing a state of deliquium; as for instance, in cases of strangulated hernia, where a general relaxation of the system is sometimes desirable. In all such circumstances, instead of a horizontal posture, the more erect the patient is kept, the more readily will a state of fainting be induced: So that the particular object in view from the operation, must at all times determine this matter.

While we thus attend particularly to the posture of the body at large, the particular position of the limb or part to be operated upon must not be neglected. In every operation, it is a matter of much importance to have the patient seated in a proper light, but in none is it more material than in blood-letting. The best general rule that can be given upon this point is, that the patient ought to be so placed,

placed, as that the principal light of the apartment shall fall directly upon the part to be operated upon, so that the vein to be opened may be made as apparent as possible. When clear day-light can be obtained, it ought to be preferred; but when this cannot be procured, one or more candles should be used.

But, whatever may be the position of the part itself, and whether the patient is to be placed on a bed or on a chair, the surgeon ought always to be seated. The operation may, no doubt, be done while the surgeon is standing; and it is most frequently indeed performed in this manner: but it can never be done either with such steadiness or neatness, as when the operator is firmly seated on a chair.

II. From the coats of veins being more flaccid than those of arteries, and from the blood not circulating with such rapidity in the former as in the latter, an opening made in one of these will seldom discharge blood freely, unless the vein be either cut

entirely across, which in general would be productive of disagreeable consequences, or unless the blood be prevented from returning to the heart, by means of a ligature placed between the heart and that part of the vein in which the opening is to be made.

The patient being properly seated, the next step must therefore be, by means of a proper bandage so to compress the vein intended to be opened, as to prevent the blood from returning to the heart; and for the same reason, an equal degree of pressure, it is obvious, ought to be applied to all the other veins of the part; for, if this circumstance should not be attended to, the communication preserved by the collateral corresponding branches would render the pressure upon any one particular vein of very little importance. But, independently of its producing a more free discharge of blood than could be otherwise obtained, this pressure upon the veins, by causing an accumulation of their contents, tends to bring them more evidently into view, and consequently

consequently renders it easier for the operator to effect a proper opening than he would otherwise find it.

Although compression, however, to a certain extent, is necessary for this purpose of accumulating a quantity of blood in the veins, and for afterwards discharging it at an opening made by the lancet, it is at the same time perfectly evident that any considerable degree of pressure, instead of forwarding these purposes, must obstruct them entirely; for, if the pressure intended to be applied to the veins only, should accidentally be carried so far as to rest materially upon the arteries connected with them, all farther access of blood to the veins would be thereby cut off, so that no evacuation of importance could take place at any opening to be made in them. Whenever it is intended, therefore, to evacuate blood in this manner, a good deal of nicety is requisite in applying this pressure upon the veins: It ought always to be carried so far as effectually to compress the veins of the part, but never to such a length

as to obstruct the circulation in the corresponding arteries. When we see that the pressure has the effect of raising the veins, and if at the same time the pulsation of the artery is distinctly felt in the inferior part of the member, we may then be certain that it is applied to a very proper degree, and that it ought not to be carried farther: For by the swelling of the veins, we are sure that they are sufficiently compressed; and by the arteries continuing to beat, it is evident that a continued flow of blood may be expected.

III. The reflux of blood to the heart being in this manner prevented, the next point to be determined, is, the best method of making an opening into the vein. Different instruments have been invented for this purpose; but there are two only which have been retained in use, and which are all, therefore, that here require to be mentioned. These are, the Lancet and the Phleme. This last, on being placed immediately on the part to be cut, is by means of a spring struck suddenly into the vein, and

and produces an opening of the exact size of the instrument employed.

The phleme, in many parts of Germany, has acquired some reputation, particularly in taking blood from the jugular vein: But there are various objections to this instrument, which will probably prevent it from ever coming into general use; and these particularly are, that we are obliged, from the nature of the instrument, to regulate the deepness to which it is to go, before it is applied: Now we know well, that in blood-letting this is a circumstance of which we are never by any means certain; for we frequently, after the introduction of a lancet, find it necessary to go much deeper than was at first expected; so that when a phleme is used, unless we employ one on every occasion of a length which cannot be frequently required, we must often meet with disappointments.

But the most material objection to this instrument is, that where there are arteries or other parts lying below the veins, and in any danger of being hurt by the operation

of blood-letting, the risk is much greater with the phleme than with the lancet: For when the lancet is used, after the vein is once opened, the orifice may be enlarged at pleasure without any additional risk, merely by carrying the instrument forward along the course of the vein at the same depth to which it was at first introduced; whereas the phleme, as soon as it enters the vein, must for certain pass directly downwards as far as its length will permit it to go; a circumstance which adds greatly to the risk of wounding the parts underneath.

Independently of this too, by the use of the lancet, we have it much more in our power to command an orifice of a determined size than when the phleme is used: So that without hesitation, we may venture to pronounce the phleme to be an instrument in no degree necessary; but for such as incline to use it, the most convenient form of one is represented in Plate III. fig. 2.

The manner of using the phleme is as follows. The bandage for producing the turgescency of the veins being applied in
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Plate IV.

Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



A. Belli Sculp!



the manner already directed, the point of the instrument *A*, with the spring properly bent, must be so placed upon the part of the vein to be opened, that an orifice of an oblique direction may be made in it on the spring *B* being let loose. The subsequent management is the same here as when the lancet is used, and will be presently pointed out.

When it is determined to employ the lancet, the form of the instrument is evidently the first circumstance requiring our attention; although we may here remark, that this point is seldom so particularly attended to as it ought to be.

The form of lancet in ordinary use, as represented in Plate IV. fig. 5. is an instrument which ought to be laid entirely aside. For opening abscesses it is very well calculated, but for the operation of blood-letting it ought never to be used.

The capital objection to this form of lancet, is, that the broadness of its shoulders produces always a wound in the external teguments of perhaps three times the size of

of the opening made in the vein; a circumstance which adds no advantage whatever to the operation: On the contrary, it produces much unnecessary pain in the first instance; it renders it frequently a very difficult matter to command a stoppage of the blood; and the wounds produced by it are commonly so extensive as to render them very liable to terminate in partial suppurations; an occurrence which always proves painful and disagreeable to the patient.

The spear-pointed lancet, on the contrary, as represented in Plate IV. fig. 3. and 4. is an instrument in every respect well calculated for the purpose of venæsection. From the acuteness of its point, it enters the teguments and vein with very little pain; which we may here observe, is with many patients a circumstance of no small importance: We are sure of making the opening in the vein equal, or nearly so, to the orifice in the external teguments: And the discharge of blood produced by an opening made with one of the lancets, is commonly put

put a stop to with great ease, immediately on removing the ligature upon the vein.

For these reasons, therefore, the spear-pointed lancet is highly preferable to every other: And although, with timid practitioners, the acute point of this instrument may appear to require more dexterity in using it than the broad-shouldered lancet; yet the difference in this respect is so inconsiderable, that very little experience must, with every practitioner who gives it a fair trial, very soon counterbalance all such objections. Indeed no surgeon ought to be trusted in letting blood with the one, whose steadiness and dexterity would be in any degree doubted with the other.

IV. The form of lancet being thus fixed upon, we come now to speak of the method of using it. The surgeon and patient being both properly feated, and the ligature having been applied for a short space of time in order to produce some degree of swelling in the veins, that vein is to be made choice of, which, at the same time that

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it appears conspicuously enough, is found to roll less than the others on being pressed upon by the fingers. There are some veins which roll so much, from being loose and unconnected with the cellular substance of the part, that although they may rise sufficiently, yet are much worse to operate upon than others which lie at a much greater depth. That vein therefore is to be preferred which not only rises so as to become perfectly evident, but which appears to be connected with some degree of firmness to the contiguous parts. It is scarcely thought necessary to observe here, that when a vein appears to be so immediately connected with a contiguous artery or tendon, as evidently to produce some risk of wounding these parts in the operation, if another vein not liable to such hazard can be procured, it ought undoubtedly to be preferred.

Veins may lie directly above both arteries and tendons, and yet no manner of risk be incurred by opening them, provided the operator is sufficiently steady and attentive;

tive; but it does now and then happen, that veins are so nearly and intimately connected with these parts, as to render it hazardous even for the most dexterous surgeon to attempt this operation.

The vein being at last made choice of, the surgeon, if he is to use his right-hand in the operation, takes a firm hold of the member from whence the blood is to be drawn, with his left, and, with the thumb of the same hand, he is now to make such a degree of pressure upon the vein, about an inch and half below the ligature, as not only to render the skin and teguments somewhat tense, but at the same time to interrupt for a little all communication between the under part of the vein, and that portion of it lying between the ligature and the thumb placed as thus directed.

The lancet being bent to somewhat more than right angles, the operator now takes it between the finger and thumb of his right-hand; and, leaving at least one half of the blade uncovered, he rests his hand on the middle finger, ring-finger, and little finger,

finger, all placed as conveniently as possible in the neighbourhood of the vein from whence the blood is to be taken; and having pushed the point of the instrument freely through the skin and teguments into the vein, he now carries it forward in an oblique direction, till the orifice is of the size he inclines to have it; taking care, during the time of pushing on the lancet, that its point be kept in as straight a direction as possible, for fear of dipping into the parts below.

The instrument is now to be withdrawn, and the surgeon removing the thumb of his left hand, is to allow the vein to empty itself freely into the cups provided for the purpose.

It is here of importance to observe, that during the time the blood is discharging, the member ought to be kept in exactly the same posture it was in when the lancet was first introduced: Otherwise, the orifice in the skin is apt to slip over the opening in the vein; a circumstance which always proves inconvenient, and on some occasions produces

produces a good deal of trouble by the blood from the vein insinuating itself into the surrounding cellular substance.

In taking hold of the lancet, we have directed the scales to form rather an acute angle with the blade of the instrument. It will even answer when they are at right angles; but a further separation proves always troublesome, by throwing the scales too much back upon the operator's hand. The length of instrument left out from between the finger and thumb is another circumstance requiring our attention; for unless a sufficient quantity of it is left uncovered, the operator cannot act with freedom. In lancets of an ordinary length, one half of the blade, as I have already remarked, or very nearly that quantity, ought always to be left out.

The entry of the lancet into the vein is the next circumstance we have desired to be attended to. By very little attention the entrance of the instrument into the vein may be distinctly perceived; for as soon as its point has entered the cavity of the vessel,

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the resistance to its farther progress is evidently found to be much diminished; and immediately on the opening being in any degree enlarged, the blood begins to rush out, which is the clearest proof of the operation being so far complete. On being thus rendered sure that the lancet has got into the vein, we have also desired that it may be carried forward in an oblique direction, taking care to keep the point of the instrument in the same degree of elevation from the instant it has passed fairly through the coats of the vein; and to this part of the operation we would beg the most particular attention. To the want of necessary caution in this matter, or rather to the improper regulations held forth upon it by every writer on this subject, much of the risk attending this operation ought to be attributed.

The propriety of an oblique direction for the course of the orifice is very obvious: For, when made altogether longitudinal, the sides of the wound are apt to fall immediately together, so as not to admit of a free discharge of blood; and, on the other hand,

hand, when the vein is cut entirely across, troublesome consequences commonly ensue from the wound being very difficult to heal: An orifice somewhat oblique with respect to the course of the vein, is therefore preferable to either. But the material circumstance to be kept in view, is the direction of the point of the lancet after it has got fairly into the vein. By almost every author who has written upon blood-letting, as soon as the lancet is known to have got into the vein, in order to extend the orifice to a sufficient length, we are directed, very properly, to carry the instrument forward: But in what manner are we desired to do so? By raising the heel of the lancet, as it is termed, at the same time that the point and edge of it is in some degree pushed forward, so as to make the point of the instrument the centre of motion.

The reason of this last precaution is, that the internal orifice of the vein may not be farther extended upwards than the external wound in the skin and other integuments; as ecchymoses, or effusions

of blood into the cellular substance, have with the broad-shouldered lancet been found frequently to occur from a contrary management. But when the spear-pointed lancet is used, this is an occurrence which may be always avoided; as, from the narrow point of the instrument, it may with safety be carried on in the cavity of the vein as far as is necessary. The orifice produced by it in the vein, must, when the operation is properly done, be always of very nearly the same extent as the external wound in the teguments: And by the same management we avoid that capital risk which it is evident must always occur from an implicit obedience to the direction alluded to; for one certain effect of raising the heel, or back part of the lancet, is, that the point of the instrument must in the same proportion be depressed; and the consequence of lowering the point of the lancet, already perhaps sliding along the under side of the vein, must at once appear to be very hazardous. For in such circumstances, if the point of the instrument be depressed, which must

must undoubtedly happen if the back part of it be elevated, it must for certain pass through the back part of the vein; so that if either an artery, nerve, or tendon, lie contiguous, they must of necessity be wounded; and I am perfectly convinced, that this cause alone has frequently been the origin both of wounded arteries, and of pricks in the nerves and tendons. So that as the hazard of the practice, whenever it is attentively considered, must at once appear evident, and as the supposed inconvenience arising from a contrary mode of operating is effectually prevented by the use of the spear-pointed lancet, all such risks therefore should be carefully avoided.

With respect to the size of orifice in cases of blood-letting, this circumstance must at all times be determined by the nature of the disorder for which the evacuation is prescribed. When a sudden loss of a considerable quantity of blood is intended, either with a view to produce a state of fainting, or for any other reason, a free large orifice is absolutely necessary; but in

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ordinary practice, no necessity occurs for this.

In using a spear-pointed lancet, an orifice of about an eighth part of an inch in length will in general answer every purpose; but when a lancet with broad shoulders is used, an opening of twice that size is little enough; for with such an instrument the orifice in the vein can seldom be above half the extent of the external opening.

After withdrawing the lancet from the orifice, we have directed the thumb of the left-hand to be removed from the place it was made to occupy. Many circumstances may appear to be related here with unnecessary minuteness, and this among others may possibly be considered as one; but in an operation of importance, every particular requires much attention. Now, one material use of the thumb placed below the part where the lancet was directed to enter, is, to keep the teguments and vein firm, so as to prevent the latter from rolling. But another advantage occurring from it is, that by making a sufficient degree of pressure upon

upon the vein, it thereby prevents any considerable quantity of blood from escaping between the time of removing the lancet, and the application of one of the cups for receiving the blood from the orifice in the vein. During this period it frequently happens, that a good deal of blood is discharged, to the great annoyance both of the patient, the operator, and bystanders; a circumstance which, with a little attention, may be always effectually prevented.

V. When the vein is properly cut, and the orifice is made sufficiently large, it rarely occurs that any difficulty is experienced in procuring all the blood that is wanted. But it now and then happens otherwise, either from the orifice of the skin and other parts having receded from the opening in the vein, or from the patient having become faintish; a situation always unfavourable to a free discharge of blood. When this last circumstance occurs, a stream of fresh air ought to be admitted to the apartment, wine or some other cordial should be administered, and the patient ought to be laid

into a horizontal posture. By these means the faintishness will in general be soon removed; but if still the blood should not flow freely, the member ought to be put into all the variety of positions that can probably assist in bringing the opening of the skin and other teguments to correspond with that of the vein, which will soon be known to have happened by the blood beginning instantly to flow. Throwing the muscles of the part into constant action, by giving the patient a cane or any other firm substance, to turn frequently round in his hand when the operation is done in the arm, will often answer in producing a constant flow of blood from a vein, when every other means has failed: And lastly, when the pulse in the inferior part of the member is felt very feeble, or especially if it cannot be distinguished at all, we may be thereby rendered certain that the ligature is too tight, and may in general have it in our power to produce an immediate flow of blood by removing the compression thus

thus improperly made upon the arteries of the part.

VI. A quantity of blood proportioned to the circumstances of the disorder, being thus discharged, the pressure upon the superior part of the vein should be immediately removed; and this being done, if the spear-pointed lancet has been used, all farther discharge of blood will in general stop immediately. The contrary, however, sometimes occurs, and blood continues to flow freely even after the ligature is removed. When this is the case, the operator ought to compress the vein both above and below the orifice by means of the finger and thumb of one hand, so as to prevent any farther loss of blood: And this being done, the limb ought to be washed and entirely cleared of any blood that may have fallen upon it; and the orifice being also cleared of every particle of blood, the sides of it should be laid as exactly together as possible, and a piece of what is named court-plaster, or any other that is sufficiently adhesive, being so applied as to retain them, it will seldom hap-

pen that any kind of bandage is necessary : But when the blood has issued with uncommon violence during the operation, and has been difficult to command after the removal of the ligature, in such instances it will be prudent to apply a small compress of linen over the plaster, and to secure the whole with a linen roller properly applied round the member.

Before applying the plaster, we have directed the orifice to be perfectly cleared of every particle of blood ; and this, it may be observed, is a circumstance of more importance than is commonly imagined ; for, by not attending particularly to this point, and from want of exactness in closing the lips of the orifice, painful swellings and consequent suppurations are often induced which a very little attention would have easily prevented. In every instance when the operation is properly done, the wound ought to heal by what surgeons call the First Intention, that is, by the parts adhering to one another without the formation of matter ; but this can seldom happen if the lips of the sore have not been very neatly

ly laid together after all the blood has been perfectly cleared away.

Another argument of importance, too, occurs for neatness in this matter. Among other troublesome consequences arising now and then from blood-letting, inflammation produced in the cavity of the vein has in some instances been known to occasion much mischief; and as nothing tends more to produce it than the admission of air to the part, by the orifice in the vein not being properly closed, this circumstance of itself strongly points out the propriety of the caution here given: For although such inflammatory affections in the internal surfaces of veins are not by any means to be considered as frequent, yet it is certain they do now and then occur; and as the consequences arising from them, especially if suppuration is induced, must commonly terminate fatally, they ought certainly, by every means in our power, to be strictly guarded against.

VII. We come now to speak of some troublesome consequences which on some occasions

occasions are found to occur from blood-letting, and which every operator ought to be as much as possible prepared to remedy. The most material of these are, small tumours occasioned by effusions of blood from the orifice of the vein into the surrounding cellular substance; wounds of the artery lying contiguous to the vein; pricks of the nerves and tendons; and lastly, inflammation, induced in the internal cavity of the vein, as we have just now mentioned. These we shall now, under separate heads, proceed to treat of particularly *.

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* Among other reasons which we have given for preferring a spear-pointed lancet, it was observed, that by means of it the operation of blood-letting is attended with much less pain than when the broad-shouldered lancet is used: And the prevention of pain is a matter of such importance, that nothing should be omitted that can in any degree contribute to it.

In every operation it is of much consequence to have all the necessary instruments in the most complete order; but in no instance is it of such importance to attend to this circumstance as in blood-letting. Well-tempered lancets will no doubt answer tolerably well, even after they have been frequently used; insomuch that

SECTION II.

Of a Thrombus, or Ecchymosis.

WE have already desired, that in the operation of blood-letting, the member should be retained in the very same posture it was in when the lancet was introduced, till the whole quantity of blood intended to be taken is evacuated. When this direction is not duly attended to, it commonly happens, that a small tumour is raised immediately above the orifice
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that I have heard even well-employed surgeons assert, that they have used one or two lancets only during the course of many years practice, without ever having them touched by a cutler. But it is very certain, that every time a lancet is used, it must be injured more or less; so that, as the prevention of pain is with most patients a matter of no small consequence, I think it ought to be laid down as a fixed rule, never to use the same lancet twice, without putting it into the hands of a cutler. This I have long been in the practice of doing, not only with lancets, but with every cutting instrument; and the trouble and expence attending it is very inconsiderable, when compared with the advantages resulting from it.

in the vein, by the blood insinuating itself into the cellular substance of the neighbouring parts. Such a tumor, when round and small, is termed a Thrombus; and when more diffused, an Ecchymosis.

Immediately on the appearance of such swellings, the ligature ought to be removed from the superior part of the vein; and the member being brought into that posture which it was in when the lancet was first introduced, the ligature may be again renewed; and it will thus be frequently found that a free return of blood will be induced, which commonly carries off the swelling altogether, or at least prevents it from producing any further obstruction to the discharge of blood. But it does now and then happen, that these swellings come at once to such a size, as entirely to preclude every possibility of finishing the operation at the orifice first made in the vein. Even here, however, the ligature ought to be immediately removed, as the most effectual method of preventing an increase of the tumor.

mor. By continuing the bandage on the vein, the blood still continues to be forced in great quantities into the surrounding cellular substance; and by the same means such swellings are induced, as now and then give a great deal of trouble, which by a contrary management might easily have been prevented from coming to any considerable height.

In such occurrences, as it is in vain to expect any considerable quantity of blood from the orifice first made, the next step to be taken is, to finish the operation, not by another opening in the same vein, which in such circumstances would seldom be found to bleed freely, but in any other that lies most convenient.

When tumors of this kind do not arrive at any great size, very little is necessary to be done for their dispersion, as the effused blood is commonly soon absorbed. When it is found necessary, however, to have recourse to discutient remedies, those of the astringent kind are by far the most effectual; and of this class brandy or any other

other ardent spirits are perhaps as useful as any. Compresses wet in a weak solution of crude sal ammoniac in vinegar, and applied with a very moderate degree of pressure, have likewise been found very effectual in discussing such swellings.

Instances, however, do now and then occur, though by no means very frequently, of the blood collected in swellings of this nature being in too great quantities to be all absorbed: and when this happens to be the case, as no good suppuration can be induced where there is nothing but red blood contained in the tumor, it ought to be immediately laid open as soon as there is reason to suppose that no farther diminution of size will probably occur from absorption. This being done, and the coagulated blood being evacuated, the sore falls to be treated like any ordinary wound.

But occurrences of this nature, are in general of very little importance when compared with other accidents which now and then proceed from blood-letting. The
first

first of these we are to treat of are wounds of arteries.

SECTION III.

Of Wounds of the Arteries.

IN the smaller arteries, as for instance in any branch of the temporal artery, openings may be made without much risk; but we know from long and repeated experience, that wounds in the larger arteries often prove hazardous, and very seldom heal without a great deal of trouble.

When in blood-letting we have reason to suspect that an artery has been wounded through the orifice made in the vein, and that blood is discharging at the same orifice both from the artery and the vein, it becomes a matter of importance for an operator to know with precision whether it is so or not. There is only one method by which a complete degree of certainty can be obtained on this point; and it is this:

When the blood is discharged from the vein only, if a degree of pressure be applied
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both immediately above and below the orifice sufficient for compressing the sides of the vein together, all farther evacuation of blood should instantly stop, even though the pressure is not so considerable as to affect the artery below; but on the contrary, if part of the blood be thrown out from the wounded artery, this pressure upon the vein, instead of putting a stop to the discharge, should rather tend to make it more considerable. When at the same time the blood is discharged *per saltum*, this will no doubt serve as a corroborating circumstance: But this test of itself, we may remark, is by no means so decisive as is commonly imagined; for, an orifice made in a vein lying directly above and immediately contiguous to a considerable artery, receives the influence of the arterial pulsation to such a degree, as to discharge blood very nearly in the same manner as if the artery itself was cut. No other proof however, is necessary of the artery being wounded, than the one we have already mentioned; for, if after the vein is thoroughly

roughly compressed both above and below the orifice, blood still continues to be discharged in great quantities and with any considerable force, our suspicions of the artery being wounded are then reduced to the utmost degree of certainty.

Allowing this to be the case, that in such circumstances we are rendered certain of the lancet having pierced the artery, what remedy ought we to have recourse to? Not the means usually advised, but the very reverse.

In all such occurrences, we are constantly directed to tie up the part with as much firmness as possible, in the first place with different compresses placed over the orifice of the vein; and lest these should not produce a sufficient degree of pressure, a piece of money or other hard substance is desired to be added, and the whole to be secured with a roller very tightly applied. But what effect ought we reasonably to expect from much pressure applied in this manner? We cannot suppose it was ever intended that any pressure of this kind

should be so considerable as to compress the artery itself; for by that means when the principal artery of a part is wounded, a total stop would be put to the circulation in the whole limb: And if the pressure, on the contrary, is to be applied in such a degree as to compress the sides of the veins only, one certain effect of this must be, to occasion a considerable resistance to the flow of blood from the artery; and that fluid being thus obstructed in its natural course, will necessarily be much more readily effused at the opening in the artery, than if the veins had been all left free and pervious to receive and transmit it.

In all such cases, therefore, instead of applying much pressure, we ought to attempt every means of relaxing the veins to the utmost; and in order to command the blood, the lips of the wound should be laid together, and retained by straps of adhesive plaster only, without any bandage whatever. And as there is not a more effectual method of relaxing the system at large, and the vascular system
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in particular, than by discharging large quantities of blood very quickly, so soon as it is known that an artery has been accidentally opened, it ought to be immediately determined to evacuate by the orifice newly made, as much blood as the patient can easily bear to lose. By these means, and by enjoining strict attention to rest of body, in order to prevent as much as possible the undue action of the arterial system, and by keeping the body cool, with the use of gentle purgatives, a low diet, and farther blood-lettings when necessary, there may always be at least some chance of such wounds in arteries being brought to reunite: Whereas a contrary management, in which much pressure upon the veins is advised, must universally do mischief, by forcing the artery to empty itself at the only passage the blood in such circumstances can be discharged at, *viz.* the opening newly made by the lancet; and by such treatment many aneurismal swellings, I am confident, have been produced,

which by the management now pointed out might easily have been prevented.

In cases of wounded arteries, however, it will frequently happen; that no treatment whatever will succeed; the orifice in the artery will not reunite, and blood in considerable quantities is effused into the contiguous parts. Even in this state of the complaint, strong pressure is advised, with a view to dissipate the tumor: But unless the swelling is of a very soft nature, and unless the blood contained in it still remains in a state of fluidity, no pressure whatever can have any influence in discussing it; for, whenever the accumulated blood has acquired any moderate degree of firmness, we cannot suppose that pressure will have any effect in driving it back by the passage from whence it originally came. Nor does it appear, that in such circumstances, compression is of any use in forwarding the absorption of extravasated blood. From theory alone we might readily be induced to draw this conclusion; but in fact we do not know a single instance in which pressure

sure in such cases appeared to be productive of any advantage.

There is indeed a particular species of swelling, which now and then occurs on an artery being in this manner wounded by a lancet that has previously passed through a neighbouring vein, and in which moderate pressure has proved serviceable. When an artery thus wounded, lies quite contiguous to the corresponding vein, the opening between the two vessels on some occasions continues pervious after the external orifice in the vein is closed, so as to produce a direct communication between the one and the other; and the vein in this manner receiving the full force of the arterial pulsation; at the same time that its coats are not possessed of a firmness sufficient to resist it, a swelling of the vein comes of course to be produced. In all such instances, moderate pressure, we may readily suppose, must be of very great use, by serving as a support to the distended vein, and by thus preventing any farther increase of its bulk; but in no other swelling arising

from blood effused from an artery can pressure be of any use; on the contrary indeed, for the reasons already enumerated, there is great cause for suspecting that it has frequently done much mischief. When we are rendered quite certain that an artery has been opened, and that the tumor produced by it is owing to blood collected in the cellular membrane around it, if keeping the limb in an easy relaxed posture, and the veins perfectly free from pressure, together with the other means formerly pointed out, do not prevent a farther increase of the swelling, no other mode of treatment with which we are acquainted will have much influence.

The tumor still continuing, by the communication between it and the artery being constantly kept up, and none of the means employed for its dispersion having any influence, the disorder in that state is to be considered as forming a species of aeurism, an ailment of which we will treat more particularly afterwards.

SECTION IV.

Of Wounds or Pricks in the Nerves and Tendons.

THE disorder we have now been describing, *viz.* wounds of the arteries, as well as similar affections of the tendons, ought never to happen in the hands of a surgeon who pretends to any tolerable degree of steadiness; for, as the arteries and tendons are both parts which previous to the operation may be easily distinguished by the finger, so as that their situation may be ascertained with exactness, it must always be the fault of the surgeon, if the point of his lancet is not so directed as to avoid them. One principal cause of such accidents occurring in blood-letting, is, as we have already shown, the ordinary practice of depressing the point of the lancet, after it has entered the cavity of the vein. This, however, we have demonstrated to be always unnecessary, and in many instances to be productive of very pernicious effects. But although, by proper at-

tention to this part of the operation, we may always with certainty avoid the arteries and tendons; yet it may be said, that the nerves, which in general are so small as not to be previously distinguished, run at all times a great risk of being wounded, and that the accidents which now and then occur from wounded nerves, are well known to be productive of as dreadful consequences as have ever succeeded to the operation of blood-letting.

But although the nerves from the smallness of their size cannot previously be distinguished by the fingers; yet, if sufficient attention be given to the direction of the point of the lancet, so as to avoid with certainty carrying the instrument through the back part of the vein, the same means which tend to secure the arteries and tendons, will with almost equal sureness prove a safeguard to the nerves: For, if the operator enters his lancet, as he ought always to do, on the superior part of the vein, and if he does not cut the vein entirely across by pushing the lancet through to the opposite

posite side of it, he can never run any risk of wounding the contiguous nerves: for these, though they run so near to the veins, yet either lie immediately below them, or at least are situated so far down upon their sides as to be out of all risk of being wounded, if the lancet is made to enter where it ought to do; and it must always be the surgeon's fault if the instrument is pushed out at the opposite side of a vein. I may venture to assert, that no inconvenience of this kind ever happens, from the wound made by a lancet in entering the anterior part of a vein: It is always on the opposite side of the vein that any mischief of this kind is produced, when the lancet, as we have already observed, is pushed entirely through; which it never ought to be, and which every surgeon ought to have steadiness enough to prevent.

But although a very ordinary degree of caution would easily prevent every occurrence of this nature; and although, when accidents of this kind do happen, the fur-
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geon is almost in every instance to blame; yet experience has on different occasions evinced, that, either from the want of attention, or from the operator not being possessed of a sufficient degree of steadiness, however easily such inconveniences ought to be prevented, yet still they do frequently occur. Nerves, and even tendons, are sometimes pricked; and the dreadful train of symptoms which such accidents commonly produce is almost inevitable.

It sometimes happens immediately on the introduction of the lancet, that the patient complains of a most exquisite degree of pain; and when this occurs, we may rest assured that either a nerve or tendon has been wounded. On some occasions, by proper management, such as evacuating a considerable quantity of blood at the orifice newly made, by keeping the part at perfect rest, and preserving the patient in as cool a state as possible, the pain at first complained of will gradually abate, and at last go off entirely without any bad consequence whatever.

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At other times, however, this pain which occurs instantaneously on the introduction of the lancet, instead of abating, begins soon to increase; a fullness, or small degree of swelling, takes place in the parts contiguous to the wound; the lips of the sore become somewhat hard and inflamed; and in the course of about twenty-four hours from the operation, a thin-watery serum begins to be discharged at the orifice.

If, by the means employed, relief is not soon obtained, these symptoms generally continue in nearly the same state, for two, or perhaps three days longer. At this time the violent pain which at first took place becomes still more distressing; but instead of being sharp and acute as before, it is now attended with the sensation of a burning heat, which still goes on to increase, and proves during the whole course of the ailment a source of constant distress to the patient. The fullness and hardness in the lips of the wound begin to increase, and the swelling in the neighbouring parts gradually extends over the whole member;

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from the foot upwards over the thigh, when the operation has been done in the lower extremity; and from the elbow down the fore-arm, and along the humerus over to the pectoral muscle and other contiguous parts, when the accident has occurred at the usual place of blood-letting in the arm.

The parts at last become exceedingly tense and hard; an erysipelatous inflammatory colour frequently appears over the whole member; the pulse by this time has generally become very hard and quick; the pain is now intense, the patient exceedingly restless; twitchings of the tendons occur to a greater or lesser degree; on some occasions, a locked jaw and other convulsive affections supervene; and, all these symptoms continuing to increase, it most frequently happens, that the sufferings of the unfortunate patient are terminated by death only.

Blood-letting, from being so very generally practised, may by many be considered as an operation by no means either
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so difficult in execution, or so dreadful in its consequences, as is here represented. Such instances indeed are not to be considered as frequent occurrences; but they happen often enough to convince us of the necessity of very great caution in this operation. In the course of my experience I have known several instances where the consequences of blood-letting have proved fatal, and the dreadful train of symptoms we have already enumerated uniformly occurred in all of them.

Different opinions have prevailed respecting the cause of these symptoms: By some they have been imputed to wounds of the tendons; and by others the tendons are supposed to be so entirely destitute of sensibility, as to be quite incapable of producing so much distress; so that wounds of the nerves they consider in all such occasions as the true cause of the various symptoms we have mentioned.

On one or the other of these suppositions the various phenomena which occur in this disorder have been explained, till

a different opinion was at last suggested by the ingenious Mr John Hunter of London. Mr Hunter supposes, that all the symptoms thus induced by the operation of blood-letting, may be more readily accounted for, from an inflamed state of the internal surface of the vein, than from any other cause. Such a state of the vein he has often traced in horses that have died of such symptoms from venæsection, where the internal coat of the vein was always found much inflamed, not only in the neighbourhood of the part where the orifice was made; but on some occasions the inflammation extended along the whole course of the vein, and seemed at last to reach the heart itself. Some instances too have occurred, of the same appearances in the human body, where the veins after death were found in a state of high inflammation. And on other occasions, inflammation having in this manner been once excited, has been known to terminate in suppuration; and the matter thus produced,

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being in the course of circulation carried to the heart, Mr Hunter supposes that in such cases death may have been induced by that cause alone.

There can be no reason to doubt the fact held forth by Mr Hunter, that in such instances, the vein in which the orifice has been made, has frequently after death been found greatly inflamed: But however ingenious his arguments may be, for concluding that this state of the vein is the original cause of all the bad symptoms enumerated; and although we must allow, that such an inflammatory affection of a vein must have a considerable influence in aggravating the various symptoms previously induced by other causes; yet I think we may very fairly conclude, that it could not probably in any one instance be able to account in a satisfactory manner for their first production.

In all the instances of this dreadful complaint which I have had an opportunity of seeing, the patient at the very instant of the operation felt a very unusual degree
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of pain. In some cases, the violence of the pain was almost insupportable. Now this we can never suppose to have been produced by the mere puncture of a vein; for altho' the coats of veins are not perhaps entirely destitute of feeling, yet we know well, that they are not endowed with such a degree of sensibility as to render it probable such intense pain could ever be induced by their being punctured in any way whatever. This inflamed state of the veins therefore, as detected by Mr Hunter after death, must be considered rather as being produced by, than as being productive of, such affections; and that such ailments should frequently produce an inflammation of the contiguous veins, is a very probable conjecture. In the course of about forty-eight hours from the operation, when the febrile symptoms are just commencing, such a degree of hardness and evident inflammation is induced over all the parts contiguous to the orifice, that it would be surprising indeed, if the vein, which is thus perhaps entirely surrounded with parts



parts highly inflamed, should not be inflamed likewise.

We shall therefore proceed upon the supposition of this inflamed state of the veins being a consequence, rather than the cause, of such ailments; and of course we now revert to one or other of the opinions long ago adopted on this subject, that all the train of bad symptoms found on some occasions to succeed to venæsection, proceed either from the wound of a nerve or of a tendon.

That a partial wound of a nerve will now and then produce very distressing symptoms, no practitioner will deny: But it has been attempted to be shown, as we have already remarked, that tendons are almost totally destitute of sensibility; and it has therefore been supposed, that their being wounded, can never account for the various symptoms known to occur in such cases.

There is great reason, however, to think, that in different instances the same train of symptoms have been induced by different

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causes; that in one instance a wounded nerve, and in others pricks of the tendons, have given rise to them. Being decidedly of this opinion myself, I think every person must be so, who has paid much attention to the subject; but as the same method of treatment proves equally applicable, whether the disease has originated from the wound of a nerve or of a tendon, we do not think it necessary to enter here into a more minute discussion of the question. Having already in a former section shown how such accidents may be almost always avoided, we shall now proceed to consider the means best calculated for preventing the symptoms coming to a great height, when it is discovered that either from inadvertence or any other cause the mischief has actually happened.

Whenever a patient at the time of the operation complains of a very exquisite degree of pain, we may always be certain that some parts have been wounded which ought not to have been touched. When this unfortunately happens, if proper attention

tion be given immediately, much may be done to obviate the accession of those symptoms which such a cause will otherwise certainly induce.

In order therefore to prevent as much as possible the consequent inflammation and other symptoms which usually ensue, a considerable quantity of blood should be immediately discharged at the orifice just made; the limb, for several days at least, ought to be kept in a state of perfect rest, care being at the same time taken that the muscles of the part be all preserved in as relaxed a state as possible; the patient should be kept cool; on a low diet; and, if necessary, gentle laxatives ought to be administered.

By such management alone, the fatal symptoms we have enumerated may frequently be prevented; and when they do occur in cases where the above precautions have not been taken, they may be considered to be as much the consequence of negligence in the subsequent treatment,

as of any thing peculiarly bad in the nature of the original accident.

When notwithstanding, however, of the means recommended, the symptoms, instead of diminishing, rather become more violent, if the lips of the orifice turn hard and more inflamed, if the pain becomes more considerable, and especially if the swelling begins to spread, other remedies come then to be indicated. In this state of the complaint, topical blood-letting, by means of leeches applied as near as possible to the lips of the wound, frequently affords much relief; and when the pulse is full and quick, it even becomes necessary to evacuate large quantities of blood by opening a vein in some other part.

The external applications usually employed in this state of the complaint, are, warm emollient fomentations and poultices, and in similar affections of other parts no remedies with which we are acquainted would probably be found more successful; for as warm fomentations and cataplasms tend in general very powerfully to promote
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the formation of pus, and as nothing would so certainly relieve the symptoms which usually occur here as a free suppuration, applications of this nature were made therefore with some apparent propriety: But from all the experience I have had in affections of this kind succeeding to blood-letting, I am now perfectly convinced, that little or no advantage is ever to be expected from remedies of this class. On the idea of being able to induce a free and kindly suppuration on the wound, and having great reason to think, from its effects in similar cases, that all the symptoms would be thereby rendered more mild, I must own that in several cases I went into the use of applications of this kind to the greatest possible degree. Unfortunately, however, the advantages resulting from them never answered my expectations; so that at last I was induced to make trial of a very different set of remedies.

Although, at the time of thus using applications of the warm emollient kind, I did not attend particularly to the cause of

their failure, yet I now think that this circumstance may be very easily accounted for. The parts here principally concerned being almost entirely membranous, and being therefore, as we have elsewhere shown*, incapable of yielding purulent matter, a continued course of warm applications, instead of producing the wished for effect, must in all probability rather tend to aggravate all the symptoms; for when such remedies do not induce a free suppuration, the heat they convey to the parts, by acting as a perpetual stimulus, must rather tend to increase the inflammation: And in fact we find, in the complaint now under consideration, that all such applications, instead of being productive of any advantage, rather do harm. The heat of the part is here one of the most distressing symptoms; so that, instead of affording relief, warm emollient applications rather tend to augment this very tormenting source of uneasiness. The lips of

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* *Vide* Treatise on Inflammation and its consequences.

the wound from not being capable of producing a good suppuration, are, by the additional heat applied to them through the medium of such applications, rendered still more hard, swelled, and of course more painful, and the swelling of the contiguous parts also becomes more diffused over the rest of the member.

By Ambrose Paré, Dionis, Heister, and others, instead of emollient remedies, oil of turpentine, tincture of myrrh, and other heating applications, are recommended. That these would not prove effectual, I cannot from experience pretend to say; for, suspecting their powerful stimulating effects might in cases of this nature prove too irritating, for parts already by disease rendered exquisitely sensible, I have never ventured to use them: But I can from repeated experience assert, that cooling astringent applications afford much more ease, and, upon the whole, in all such ailments, prove much more effectual, than warm emollients; and of this class, the most effectual I have ever used are the sa-

turnine applications. The parts chiefly affected being alternately covered with cloths wet with a solution of saccharum saturni, and pledgets spread with Goulard's cerate, are kept more cool and easy than by any other remedy I have ever happened to use.

In all such cases, therefore, as soon as a number of leeches proportioned to the violence of the symptoms have been applied to the parts chiefly affected, and have discharged a sufficient quantity of blood, the swelling ought to be covered with pieces of soft linen wet in the saturnine solution; and these being kept constantly moist for the space of a few hours, should be succeeded by Goulard's cerate; and thus every part in any degree affected, ought to be alternately covered with one or other of these applications, as long as any degree of swelling remains.

The febrile symptoms which occur, must at the same time be attended to, by keeping the patient cool; on a low diet; preserving a lax state of the bowels; and, if necessary,

cessary, farther quantities of blood ought to be evacuated.

For the violence of the pain, which is sometimes so excessive as to destroy the patient's rest entirely, opiates ought to be freely exhibited; and when twitchings of the tendons and other convulsive symptoms supervene, medicines of this kind become still more particularly necessary. In order, however, to have a proper influence in this state of the complaint, opiates ought to be given in very full doses; otherwise, instead of answering any good purpose, they constantly tend to aggravate the different symptoms, not only by increasing the heat and restlessness, but by having an evident influence in rendering the system more susceptible than it was before of the pain and other distressing effects produced upon it by the wound: Whenever opiates therefore are in such circumstances employed, the doses ought always to be considerable.

It often happens, however, in this very alarming disorder, either from neglecting the matter altogether on the accident first happening,

happening, as is too frequently the case, or from an improper subsequent treatment by warm emollient applications, that opiates and all the other remedies enumerated are afterwards used without any advantage whatever: The fever, pain, and swelling of the parts continuing, convulsive affections of the muscles at last occur; all tending to indicate the most imminent danger. In this situation, if we have not immediate recourse to some effectual means, the patient will soon fall a victim to the disorder; and the only remedy from which much real advantage is to be expected, is a *free and extensive division* of the parts in which the orifice producing all the mischief was at first made. We know well from the repeated experience of ages, that much more pain and distress of every kind is commonly produced by the partial division either of a nerve or of a tendon, than from any of these parts being at once cut entirely across. Now the intention of the operation here recommended, is, to produce a complete

complete division of the nerve or tendon we suppose to have been wounded by the point of the lancet, and which we consider as the sole cause of all the subsequent distress.

The operation now recommended being attended with a good deal of pain, and being put in practice for the removal of symptoms from which it is perhaps difficult to persuade the patient that much danger is to be apprehended, all the remedies we have mentioned should be first made trial of before it is proposed: But at the same time, care ought to be taken, that the disorder be not allowed to proceed too far before we have recourse to it; for if the patient should be previously much weakened by the feverish symptoms having continued violent for any length of time, neither the remedy now proposed, nor any other with which we are acquainted, would probably have much influence. As soon therefore as the course already prescribed has been fairly tried, and is found to be inadequate to the effects expected from it, we ought immediately

diate to have recourse to a free division of the parts chiefly affected; and the manner of doing it is this.

As all the contiguous parts are now supposed to be much swelled and in a state of high inflammation, it is impossible to get proper access either to the nerve or tendon, but by means of a large and extensive incision; and as this cannot be effected without some risk of opening at least some large branches of arteries, the first step to be taken in this operation is, to secure the parts, against the effects of such an occurrence, by the application of the tourniquet on the superior part of the member. This precaution is necessary, not only for guarding against the loss of blood which would ensue from a division of any of the large arteries, but for preventing that interruption which would otherwise be occasioned by a constant discharge of blood from the smaller vessels during the operation. The tourniquet indeed is more particularly requisite with a view to the prevention of this last inconvenience, than for any other reason;

reason; for although it is proper by means of it to guard against the effects to be expected from a division of any of the large arteries, yet with proper caution such an occurrence may in most cases be very easily avoided.

The tourniquet then, being properly applied, a transverse incision should be made with a common scalpel *, upon the parts chiefly affected, and it ought to run in a direction exactly across the original orifice in the vein.

In every surgical operation, rashness is undoubtedly improper, and is often productive of disagreeable consequences; but unnecessary caution, which almost constantly proceeds from the operator being inaccurate and confused in his ideas of the anatomy of the parts, generally produces such a degree of timidity, as ultimately proves more hurtful to the patient, than even an unusual degree of boldness; for in every operation where an incision is necessary, if the first cut is not made fully sufficient

* For the most proper form of a scalpel, see Plate IV.

sufficient for the intended purpose, all the subsequent steps of it are commonly either much retarded, or perhaps rendered entirely ineffectual.

In no operation whatever, is it more necessary than in this, to act with proper freedom in laying the parts sufficiently open by the external incision. A small incision puts the patient to nearly the same degree of pain as a larger cut; and it has this material inconvenience, that the surgeon cannot go on with the future steps of the operation with so much ease and expedition as when an extensive opening is made at first.

The external teguments being thus freely divided, the operator is now to proceed in a gradual manner, making one slight incision after another, taking care, if possible, to avoid wounding either the larger arteries or veins; and he is to go on in this way, to endeavour to detect the wounded nerve; or if there is no possibility of doing so, even by great caution and nicety in wiping away with a sponge every particle of

of blood as he goes along, he must still continue to proceed in this slow gradual manner, till he has divided every part between the skin and periosteum ; the tendons, larger arteries, and veins excepted.

At this time the tourniquet should be loosened ; and in all probability the patient will be found to express much satisfaction at what has been done : For, if the part is thus divided which originally had been pricked by the lancet, and from whence all the subsequent distress proceeded, an immediate relief will now be obtained ; but, on the contrary, if the pain still continues violent, we are thereby rendered almost certain that the mischief lies altogether in one or other of the tendons. An accurate examination, therefore, must now be made, by clearing the parts effectually with a sponge ; and that tendon lying most contiguous to the vein in which the orifice was made, will in all probability be found either wounded, or in an evident state of inflammation ; but at all events, whether any such appearances are detected

detected or not, no hesitation whatever should occur as to the propriety of dividing that tendon which lies most contiguous to the vein; or if two or even three tendinous extremities should happen to lie in the way, and to be all therefore equally liable to suspicion, they ought all undoubtedly to be cut entirely across; and this being properly effected, it will seldom happen that relief is not immediately derived from it: And at any rate, this being done, every attempt will have been made from which we could expect any benefit.

The parts having been thus freely divided, the tourniquet must now be made as slack as possible; and such arteries as have been wounded must be properly secured. The parts are then to be covered with soft easy dressings, and to be afterwards treated in the same manner as a wound from any other cause.

The remedy here recommended, if every circumstance is not duly attended to, may probably be considered as severe; for such

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an incision carried to such a depth, must no doubt be attended with much pain; and the division of one or more tendons runs a considerable risk of producing at least a partial lameness, and that too probably for life, of the whole member: But if we consider for a moment the importance of the object in view, every consideration of this kind must immediately lose all weight. It is not a trifling advantage we are in pursuit of, nor can such a painful operation be ever with propriety recommended except in very urgent circumstances. In the present instance, however, it is clear that the patient's life is in all probability to depend on the event of this operation; so that the most timid operator, if he is at all capable of reflection, must admit the propriety of putting it in practice; and from the event of almost every case of this nature, that has once advanced to the length for which we have recommended the operation in question, it may with great certainty be pronounced, that every patient in such circumstances is in the utmost hazard of his life; so that in

such a desperate situation, no remedy that affords any tolerable chance of a recovery, however painful it may be, can with propriety be condemned.

From reasoning alone, we would readily conclude, that in all such circumstances no remedy whatever would more probably prove successful than the operation we have now advised; but when the propriety of the measure is enforced by the successful issue of repeated trials, no argument adduced against it ought to meet with much attention. In different occurrences of this kind, of less importance, I have seen much advantage ensue from the practice here recommended; but in one instance, where the patient had been blooded in the median cephalic vein of the arm, the disorder had got to such a height, and had so obstinately resisted every other remedy, that there was every reason to suppose death must have ensued, had it not been for the effects of a free and very deep incision made into the parts affected. The patient, from being evidently in very great hazard,

hazard, and in exquisite pain, experienced almost instantaneous relief; and the swelling, which had previously resisted the effects of every other remedy, and had even continued to spread, began soon to abate, and a perfect recovery was obtained in a much shorter space of time than could have been expected.

There is not therefore a point in surgery that I am more satisfied of, than the propriety of such an operation in all such desperate cases as the one we have been treating of; but to such as have not happened to meet with occurrences of this nature, the remedy proposed will not only appear to be too violent for the disease, but they will also be induced to consider the length of discussion here gone into to be much more prolix than is necessary: A single instance, however, of the dreadful symptoms now and then induced by accidents of this kind, will be fully sufficient to convince any man, that the subject now under consideration is perhaps one of the most important in the department of surgery.

All that has hitherto been said on blood-letting relates to the operation in general; We shall now proceed to consider the operation as it is put in practice in particular parts; and first of blood-letting in the arm.

SECTION V.

Of Blood-letting in the Arm.

BLOOD-LETTING is more frequently practised on the fore-part of the arm at the joint of the elbow, than in any other part of the body. The veins are in general more conspicuous in this place; but no other reason can be assigned for this preference: On the contrary, the near contiguity of nerves, tendons, and of large arteries, to these veins, makes the operation more hazardous here than in any other part. From this circumstance, therefore, I have often been induced to consider the fixing on this part for the ordinary operation of blood-letting, as a very capital error; and the more especially as blood may be drawn from veins in other parts with the same ease

ease as from those of the arm, and with much less danger; particularly from the veins of the neck, from those of the under part of the legs, ankles, and feet.

Blood-letting in the lower extremities has indeed in general been confined to a particular set of disorders; chiefly to those of females: But no good reason, I imagine, can be assigned for this; for it is now well known, that, in general blood-letting, the place from whence the blood is drawn, is of little importance, and that the effects of the operation depend almost solely upon the quantity of blood that is discharged in a longer or shorter space of time.

Blood-letting at the arm may be safely performed by a surgeon of steadiness and attention, as in the hands of such a man there can be little or no risk of the lancet going deeper than the vein, and in this case nothing bad can ensue: But, in ordinary practice, I should at all times rather incline to have the operation done in some other part. It may almost always be done with ease in the feet and ankles; and if the

K 3 operation

operation is properly performed, the same quantity of blood may be drawn from the veins of these parts, as from veins of an equal size in any other part of the body.

But whether the idea now suggested should ever be generally adopted or not, this is so far evident, that if the cautions we have pointed out are proper on every occasion when venæsection is practised, they are necessarily much more so when the operation is done in the arm, where the veins lie so very contiguous to parts which cannot be wounded without producing very alarming symptoms.

Having already considered with minuteness the various steps of the operation of blood-letting, so far as they relate to it in a general way; in order to avoid repetitions, nothing will now be pointed out but what is particularly required in performing this operation in the arm.

In applying the ligature for the stoppage of the circulation, it ought to be placed about an inch or an inch and half above the joint of the elbow; and, in order to prevent

prevent the ends of it from interfering with the lancet, the knot should be made on the outside of the arm. In general, one knot might answer; but a slip-knot being made above the first, renders it more secure, and it is very easily done.

In making choice of a vein from whence blood is to be taken, the general rules we have already laid down upon this point must be here particularly attended to. That vein which appears most conspicuous, at the same time that it rolls least under the skin, should in general be fixed upon; but when an artery is found to lie immediately below, and quite contiguous to such a vein, the operator, if he is not perfectly satisfied with his own steadiness, ought rather to take some other. In general, however, the artery lies so low in this place, that the median basilic vein, under which it commonly runs, may be opened with perfect safety; and as this vein in general appears more conspicuous than any of the others, probably from the continued pulsation of the artery below ob-

structing in some measure the passage of its contents, it is for this reason therefore to be made choice of rather than any of the rest. Other circumstances occur too, which render the median basilic preferable to the cephalic or median cephalic veins for the operation of blood-letting. The former, viz. the median basilic, is less deeply covered with cellular substance, and by lying towards the inner part of the arm it is more thinly covered with the tendinous expansion of the biceps muscle, than either of the others. From these circumstances the operation is always attended with less pain when done in this vein than in any of the others; and that consideration alone ought to have a good deal of influence in determining the choice of an operator.

In blood-letting at this part of the arm, although the operation may be done with the right hand either upon the right or left arm of the patient; yet it is much more neatly done by performing with the right hand upon the right arm,
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and with the left hand upon the left arm of the patient; and whoever attempts the contrary, must find that it cannot be done but in a very awkward manner, as the operator can never in any other way apply his hand properly to the patient's veins.

In very corpulent people, it sometimes happens, that all the larger veins lie so deep as not to be discovered by the eye; but when they are sensibly felt by the fingers, even although they cannot be seen, they may be always opened with freedom. In a few instances, however, it is the case, that they can neither be distinguished by the eye, nor by the finger: In such a situation, as they may in general be met with about the wrist, or on the back part of the hand, the ligature should be removed from the upper part of the arm; and being applied about half-way between the elbow and wrist, the veins below will thereby be brought into view; and wherever a vein can be evidently observed, there can be no danger in having recourse to the operation.

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SECTION VI.

Of Blood-letting in the Jugular Vein.

FOR inflammation of the throat, disorders of the eyes, and other affections of the head, when it is wished to evacuate blood from vessels near to the parts affected, it is frequently judged proper to open the external jugular veins; and the manner of doing the operation is this:

There is only one ramification of this vein, viz. its principal posterior branch, which can easily be brought so much into view, as to be with propriety opened; and even this lies deeply covered with parts, not only with the skin and cellular substance, but with the fibres of the platisma, myoides muscle, so that a considerable degree of pressure becomes necessary in order to raise it to any height. With a view to produce this, the operator's thumb is commonly advised to be placed upon the vein, so as to compress it effectually about an inch or inch and half below where

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the opening is to be made. This, however, seldom proves sufficient for the purpose, as the blood, on being stopped in its progress through this branch, easily finds a passage to the other veins; so that unless the principal vein on the other side of the neck be also compressed, the vein to be opened can never be fully distended. In order to distend it sufficiently, a firm compress of linen should be applied on the largest vein on the opposite side of the neck; and an ordinary garter, or any other proper ligature, being laid directly over it, should be tied with a firm knot below the opposite arm-pit; taking care to make such a degree of pressure, as to put an entire stop to the circulation in the vein, which in this way it is easy to do without producing any obstruction to the patient's breathing.

This being done, and the patient's head being properly supported, the operator, with the thumb of his left hand, is now to make a sufficient pressure upon the vein to be opened, and with the lancet in his right

right hand is to penetrate at once into the vein; and, before withdrawing the instrument, an orifice should be made large enough for the intended evacuation. It may be proper to observe, that a more extensive opening ought always to be made here than is necessary in the arm, otherwise the quantity of blood is generally procured with difficulty: And besides, there is not the same necessity for caution on this point here that there is in the arm: for it seldom or never happens, that any difficulty occurs in this situation, in putting a stop to the blood after the pressure is removed from the veins; all that is commonly necessary for this purpose being a slip of adhesive plaster, without any bandage whatever.

In order to bring the vein more clearly into view, so as afterwards to be able to open it with more exactness, it has been directed, that the skin, cellular substance, and muscular fibres covering the vein, should be previously divided with a scalpel before attempting to push the lancet

cet into it. There is not, however, any necessity for this precaution, as it rarely happens that any difficulty is experienced in procuring a free discharge of blood by opening the vein and teguments at once in the manner directed: And it is here, as in every instance where it is necessary to take blood by a lancet, if it be not done at once, the patient is much disappointed, and is sure to attribute the failure entirely to a fault in the operator.

SECTION VII.

Of Blood-letting in the Ankles and Feet.

WHAT has already been said on the operation of blood-letting, renders it quite unnecessary to be here in any degree minute. When blood is to be discharged from the veins of these parts, it will be readily understood, that the first step to be taken is a proper compression of the veins, so as to produce an accumulation of their contents. The ligature for this purpose being applied with a sufficient degree

degree of tightness a little above the ankle-joint, all the branches of the vena saphena, both in the inside and outside of the foot, come at once into view; and as this vein lies everywhere very superficial, being in general covered with skin only, wherever a proper vein appears conspicuously, it may with safety be opened.

With a view to encourage the discharge of blood, it has been a constant practice in blood-letting in these veins, to dip the feet into warm water immediately on the orifice being made. But this is a very inaccurate method of proceeding, as the quantity of blood taken in this manner can never be ascertained with precision; for the blood being all mixed with the water, the operator can never be in any degree certain as to this point: And besides, there does not appear to be any necessity for this assistance; for, when the compression of the superior part of the veins is made effectual, and the orifice is of a proper size, I never found more difficulty in obtaining a full discharge of blood from the

the veins of these parts, than from any other veins of the body.

On removing the ligature, the discharge is generally stopped at once; so that a piece of adhesive plaster applied over the orifice, answers all the purposes of a bandage.

These are the several parts from whence blood is usually taken by venæsection; but on some occasions, where the contiguous parts have been particularly affected, it has been thought advisable to open the veins of other parts, viz. those of the tongue, of the penis, the external hemorrhoidal veins, &c. When it is found necessary to discharge blood in this manner from the penis, the veins can be easily brought into view by producing an accumulation of their contents in the same manner as in other parts of the body, through the intervention of a ligature: But, in the tongue, in the hemorrhoidal veins about the anus, and other parts where compression cannot be applied, all that the surgeon can do, is, to make an orifice of a proper size in that part

part of the vein which shows itself most evidently; and if a sufficient discharge of blood is not thus produced, as there is no other method of effecting it, immersing the parts in warm water may in such circumstances be a very necessary measure.

Having thus considered the various modes of discharging blood by venæsection, we now proceed to arteriotomy.

SECTION VIII.

Of Arteriotomy.

WHATEVER particular advantages may in theory have been expected from arteriotomy, and however some of its supporters may in their closets have recommended it; not only as being in many instances preferable to venæsection, but as an operation perfectly safe even in vessels of considerable size; yet the most strenuous friends to the practice, have shrunk from attempting it on the larger arteries. Instances have no doubt occurred of large arteries having been opened without any dan-

danger ensuing; but these are so exceedingly rare, that no practitioner of experience will be induced by them, deliberately, or from choice, to open any considerable artery. The smaller branches of arteries may indeed be opened with great safety when they are not deeply covered, and especially when they lie contiguous to bones, as in such situations, so soon as the quantity of blood intended to be taken is discharged, all farther loss of blood may be very easily prevented by compression; but the opening of any of the larger arteries must be always attended with so much hazard, and the advantages to be expected from it in preference to venæfction are apparently so trifling, as must in all probability prevent it from ever being carried into execution.

There are very few arteries, therefore, which with any propriety can be opened; the different branches of the temporal are the only arteries indeed from whence blood in ordinary practice is ever taken: but, if a fanciful practitioner should at any time

incline to take blood in this manner from a different part, it may be done with great safety from one of the arteries running on each side of the fingers. About the middle of the last phalanx, this artery is sufficiently large for discharging a considerable quantity of blood; in most cases it lies very superficial, and in this situation there can seldom much difficulty occur in putting a stop to the evacuation. In performing this operation on any of the temporal branches, if the artery lies superficial, it may be done with one push of the lancet, in the same manner as was directed for venæsection; but, when the artery lies deeply covered with cellular substance, it is always necessary to lay it fairly open to view, before making the orifice with the lancet: For in all the smaller arteries, when they are cut entirely cross, there is little chance of being able to procure any considerable quantity of blood from them: as, when divided in this manner, they retract considerably within the surrounding

parts,

parts, which commonly puts a stop to all farther evacuation.

Some degree of nicety is also necessary in making the opening into the artery, of a proper oblique direction, neither quite across, nor directly longitudinal; for a longitudinal opening never bleeds so freely, either in an artery or in a vein, as when its direction is somewhat oblique.

If the opening has been properly made, and if the artery is of any tolerable size, it will at once discharge very freely without any compression; but when the evacuation does not go on so well as could be wished, the discharge may be always assisted by compressing the artery immediately above the orifice, between it and the corresponding veins. The quantity of blood being thus discharged, it will commonly happen, that a very slight compression on these smaller arteries will suffice for putting a stop to the evacuation: But any degree of pressure that is found necessary may be applied here as in venæflection, by means of a linen compress and roller;

the orifice being first entirely cleared of blood, and properly covered with a bit of adhesive plaster. If that should not be found to answer, a compress of linen should be applied over it, the whole being then to be secured with a roller.

It happens, however, in some instances, that this does not succeed, the orifice continuing to burst out from time to time, so as to be productive of much distress and inconvenience.

In this situation there are three different methods by which we may with tolerable certainty put a stop to the farther discharge of blood. *1st*, If the artery is small, as all the branches of the temporal arteries commonly are, the cutting it entirely across, exactly at the orifice made with the lancet, by allowing it to retract within the surrounding parts, generally puts an immediate stop to the discharge. *2d*, When that is not consented to, we have it always in our power to secure the bleeding vessel with a ligature, as we would do an artery accidentally divided in any part of the body,

body. And, lastly, if neither of these methods is agreed to by the patient, we can, by means of a constant regular pressure, obliterate the cavity of the artery at the place where the operation has been performed, by producing an accretion of its sides. Different bandages have been contrived for compressing the temporal artery; but none of them answer the purpose so easily and so effectually as the one represented in Plate VI. fig. 3.

As some time, however, is required to obliterate the cavity of the artery, this method is accordingly more tedious: but to timid patients it generally proves more acceptable than either of the other two.

Having thus finished the consideration of the various methods employed for evacuating blood from the larger arteries and veins, we now proceed to the consideration of topical blood-letting.

SECTION IX.

Of Topical Blood-letting.

WHEN, either from the severity of a local fixed pain, or from any other cause, it is wished to evacuate blood directly from the small vessels of the part affected instead of opening any of the larger arteries or veins, the following are the different methods employed for effecting it, viz. By means of leeches; by slight scarifications with the shoulder or edge of a lancet; and, lastly, by means of an instrument termed a Scarificator, containing from one to twenty lancets or more, fixed in such a manner, that when the instrument is applied to the part affected, the whole number is by means of a spring driven suddenly into it, and to a greater or lesser depth at pleasure. This being done, as it is the smaller blood-vessels only that by this operation are ever intended

intended to be cut, and as these do not commonly discharge freely, some means or other become necessary for promoting the evacuation.

Various methods have been proposed for this purpose. Glasses fitted to the form of the affected parts, with a small hole in the bottom of each, were long ago contrived; and these being placed upon the scarified parts, a degree of suction was produced by a person's mouth sufficient for nearly exhausting the air contained in the glass: And this accordingly was a sure enough method of increasing the evacuation of blood to a certain extent *. But, as this was attended with a good deal of trouble, and besides did not on every occasion prove altogether effectual, an exhausting syringe was at last adapted to the glass, which did indeed answer as a very certain method of extracting the air contained in it: But the application of this instrument for any length of time is

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* Celsus, lib. 2. cap. 11.

very troublesome; and it is difficult to preserve the syringe always air-tight.

The application of heat to the Cupping Glasses, as they are termed, has been found to rarify the air contained in them to a degree sufficient for producing a very considerable suction. And as the instrument in this simple form answers the purpose in view, with very little trouble to the operator, and as it is at all times easily obtained, the use of the syringe has therefore been laid aside. The glasses for this purpose, it is evident, must be entire; for if there is the least communication allowed between their cavities and the surrounding atmosphere, no effect whatever will be produced by them.

There are different methods employed for thus applying heat to the cavity of the glass. By supporting the mouth of it for a few seconds above the flame of a taper, the air may be sufficiently rarefied; but if the flame is not kept exactly in the middle, but is allowed to touch either the sides or bottom of the glass, it is very apt to make

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it crack and fly in pieces. A more certain, as well as an easier method of applying the heat, is to dip a piece of soft bibulous paper in spirit of wine, and having set it on fire, to put it into the bottom of the glass, and, on its being nearly extinguished, to apply the mouth of the instrument directly upon the scarified part. This degree of heat, which may be always regulated by the size of the piece of paper, and which it is evident ought to be always in proportion to the size of the glass, if long enough applied proves always sufficient for rarefying the air very effectually, and at the same time, if done with any manner of caution, never injures the glass in the least.

The glass having been thus applied, if the scarifications have been properly made, they instantly begin to discharge freely; and as soon as the instrument is nearly full of blood, it should be taken away, which may be always easily done by raising one side of it, so as to give access to the external air. When more blood is wished to be taken, the parts should be bathed

bathed with warm water; and, being made perfectly dry, another glass exactly of the size of the former should be instantly applied in the very same manner; and thus, if the scarificator has been made to penetrate to a sufficient depth, so as to have cut all the cutaneous vessels of the part, almost any necessary quantity of blood may be obtained. It sometimes happens, however, that the full quantity intended to be discharged cannot be got at one place: In such a case, the scarificator must be again applied on a part as contiguous to the other as possible; and this being done, the application of the glasses must also be renewed as before.

When it is wished to discharge the quantity of blood as quickly as possible, two or more glasses may be applied at once on contiguous parts previously scarified; and on some occasions, the quantity of blood is more quickly obtained when the cupping-glasses are applied for a few seconds upon the parts to be afterwards scarified. The suction produced by the glasses

glasses may possibly have some influence in bringing the more deep-seated vessels into nearer contact with the skin, so that more of them will be cut by the scarificator.

A sufficient quantity of blood being procured, the wounds made by the different lancets should be all perfectly cleared of blood; and a bit of soft linen or charpie, dipped in a little milk or cream, applied over the whole, is the only dressing that is necessary: When dry linen is applied, it not only creates more uneasiness to the patient, but renders the wounds more apt to fester than when it has been previously wetted in the manner directed.

Although this operation is by no means difficult in the execution, yet a good deal of practice is necessary to perform it in a neat and successful manner; but with a little attention, any operator may soon become so expert, as to be able to take any quantity of blood by it that can ever be necessary.

In some cases of local pains, and in others where suppuration of the part has been wished

wished for, an operation termed *dry-cupping* has been proposed, and in some instances its advantages are said to have proved considerable. This consists in the application of the cupping-glasses directly to the parts affected, without the use of the scarificator. By this means a tumor is produced upon the part; and where any advantage is to be expected from a determination of blood to a particular spot, it may probably be more easily accomplished by this means than by any other.

In Plate VI. are represented a scarificator, and different sizes and figures of cupping-glasses, with which every operator ought to be amply supplied, so as to be able to adapt a glass to every part from whence it may be proper to discharge blood in this manner. When the part from which it is intended to produce a local evacuation of this kind is so situated that a scarificator and cupping-glasses can be applied, this method is greatly preferable to every other; but it now and then happens, that parts are so situated as not to admit
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Plate V.

Fig. 1.

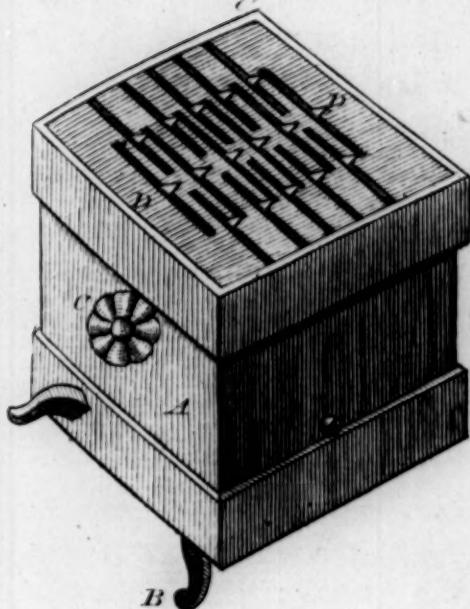


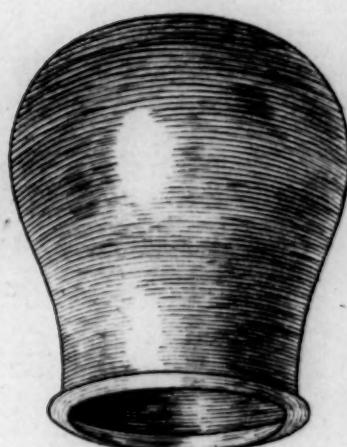
Fig. 2.



Fig. 3.



Fig. 4.



"Bell. cup."



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of their application: Thus, in inflammatory affections of the eye, of the nose, and of other parts of the face, the scarificator cannot be properly applied directly to the parts affected. In such instances, leeches are commonly had recourse to, as they can be placed upon almost any spot from whence we would wish to discharge blood.

In the application of these animals, the most effectual method of making them fix upon a particular spot, is to confine them to the part by means of a small wine-glass. Allowing them to creep upon a dry cloth, or upon a dry board, for a few minutes before application, makes them fix more readily; and moistening the parts on which they are intended to fix, either with milk, cream, or blood, tends also to cause them adhere much more speedily than they otherwise would do. So soon as the leeches have separated, the ordinary method of promoting the discharge of blood, is to cover the parts with linen cloths wet in warm water: In some situations, this may probably be as effectual a method as any other;

other; but wherever the cupping-glasses can be applied over the wounds, they answer the purpose much more effectually: Wherever the figure of the part, therefore, will admit of their application, they ought undoubtedly to be employed.

Among other methods of effecting what we term Local Blood-letting, scarifications with the edge or shoulders of a lancet was mentioned as one: There are not many instances in which this proves very necessary; but now and then cases do occur in which blood may be taken in this manner, when it cannot with propriety be discharged by any other means. This is particularly the case in some inflammatory affections of the eye, where the ball of the eye is chiefly affected, and where general blood-letting and evacuations from the neighbouring parts do not prove effectual. In such affections it frequently happens, that scarring the vessels of the tunica conjunctiva of the eye, so as to evacuate perhaps only a very few drops of blood, is productive of much advantage. The mere division of
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the vessels in such cases, has indeed been supposed to be of use; but I have constantly observed, that the advantage produced by this operation, has been in general nearly in proportion to the quantity of blood discharged by it.

Different methods have been proposed for performing it, but the easiest and most effectual, is by means of the edge or shoulder of a lancet. For this purpose, the upper eye-lid being supported by the hand of an assistant, and the under palpebra being secured by the fingers of the operator's left hand, with the lancet in his right hand, a number of slight scarifications should be made through the different vessels that seem to be most turgid. In order to secure the eye properly, it has been advised to have it previously fixed by a speculum before attempting to scarify the vessels. There is not, however, any occasion for this precaution, as the eye may be always made sufficiently steady for this operation, by gentle pressure with the fingers in the manner directed; and besides,

sides, in this inflamed state of the eye, the pressure produced by a speculum is very apt to do mischief.

To such as have not seen this operation put in practice, it may perhaps appear to be too hazardous to be attempted by those who are not much accustomed to it; but a very moderate degree of steadiness renders it very easily and safely practicable. All the vessels intended to be cut being freely divided, bathing the eye in warm water is the most effectual method of encouraging the discharge.

In the same manner, scarifications of this kind may at times be usefully employed in removing inflammatory affections of the eye-lids; and the same remedy may now and then, perhaps, be used with advantage in similar affections of other parts.

Among other methods that have been proposed for scarifying the blood-vessels of the eye, the beards of rough barley were at one period much extolled, and are still employed by some individuals.

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By drawing them over the surface of the eye, in a direction contrary to the sharp spiculae with which they are furnished, a considerable discharge of blood is thereby produced. But the pain attending this operation is exquisite; and as it does not possess any superior advantage to the method with the lancet, it is now falling into general disuse.

We have thus finished the consideration of the various means employed in surgery for evacuating blood from the system; and as the disorder termed Aneurism is frequently produced by an unguarded manner of performing one of the operations we have just been describing, the farther consideration of this subject cannot, we think, be any where more properly introduced than in this place, where one of the principal causes tending to produce it has been so lately treated of.

C H A P. IV.

Of A N E U R I S M S.

SECTION I.

General Remarks on Aneurisms.

THE term Aneurism, was originally meant to signify a tumor formed by the dilatation of the coats of an artery; but by modern practitioners, it is made to apply not only to tumors of this kind, but to such as are formed by blood effused from arteries into the contiguous parts; a circumstance

cumstance which may happen either from an artery being punctured with a sharp instrument, or from a rupture of its coats produced by any other cause.

The first species of the disorder, viz. that which depends on an extension or dilatation of the coats of an artery, has been denominated the True Aneurism; and the latter, or that which proceeds from an effusion of arterial blood into the surrounding parts, has been commonly termed the False Aneurism.

As the introduction of new appellations frequently tends to produce confusion, necessity alone can justify the attempt; and accordingly it will rarely happen, in the course of the present work, that any innovation of this kind is made. In the present instance, however, as the nature and treatment of the disorder may be rendered more clear and distinct by a change of terms applied to the different species of aneurism, an attempt of this kind may, for such a reason, it is hoped, be made without any impropriety.

In that species of the disorder depending upon the dilatation of an artery, as the tumor is always circumscribed, and contained within coats peculiar to itself, it may therefore properly enough be termed the Encysted Aneurism; and the other, from the swelling spreading extensively over the neighbouring parts, may with equal propriety be termed the Diffused Aneurism.

As these two species of the disorder are very different from one another, not only in their causes, appearance, and effects, but even in the treatment necessary for their removal; it will be proper, therefore, to enter into a separate consideration of each of them.

In the true or encysted aneurism, when externally situated, the tumor when first observed is commonly very small and circumscribed; the skin retains its natural appearance; when pressed by the fingers, a pulsation corresponding with that of the artery below is evidently distinguished; and with very little force the contents of

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Sect. I. *Of Aneurisms.*



the swelling, while they are yet soft and fluctuating, may be easily made to disappear entirely.

If means properly calculated for the removal of the disease are not now put in practice, or if upon trial they should be found to fail, the swelling begins to increase, becomes more prominent, and continues in a gradual manner to acquire a larger size. For a considerable time the skin and teguments retain their natural appearance; the patient does not complain of pain, not even on pressure; the tumor continues of an equal softness; and its contents are still compressible, yielding considerably, and in general disappearing entirely on the application of pressure. At last, however, when the swelling becomes very large, the skin loses its ordinary colour, becomes pale, and, in the more advanced stages of the disease, even œdematosus: The pulsation still continues; but the tumor although soft in some parts, yet in others is firm, and cannot now be made to yield much upon pressure, part of the

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contained blood having in this stage of the disease become hard by coagulation.

The swelling continuing to increase, in a gradual manner it becomes more painful, and produces much distress; the skin turns livid, apparently verging to a gangrenous state: at last, an oozing of bloody serum occurs from the teguments; and if a real mortification does not take place, the skin cracks in different parts; and now the force of the artery not meeting with so much resistance as before, in a very short space of time, if the vessel is large, a period is put to the patient's existence, by the blood bursting out with such violence as to produce almost instantaneous death; at least in the larger arteries of the trunk of the body, this is the ordinary event of all such affections. In the extremities, however, the arteries are not so large as by their rupture to be capable of producing effects so immediately fatal; and besides, we can here, in general, by means of the tourniquet, be always certain of preventing

preventing this sudden termination of the disease.

In aneurismal affections of the larger arteries, the effects produced upon the neighbouring parts, by the constant pulsation and gradual augmentation of the tumor, are often surprising. The softer parts we might, *a priori*, expect to yield to a very considerable extent; but the hardest parts of the body, probably from the very circumstance of their *not being capable of yielding*, evidently suffer more from the effects of this kind of pressure, than either membranes, muscles, or ligaments. Even the bones frequently undergo a very great degree of derangement, by the pulsation and distension of contiguous aneurisms: Sometimes they are separated entirely from one another at the different joints: On some occasions they are elevated much out of their natural situations; and in many instances they have been found entirely dissolved.

Occurrences of this kind are not common in any of the extremities, as it is the

strong pulsation of the aorta only, or of some of the larger arteries at no great distance from the heart, that we can ever suppose should be followed by such consequences. Now and then, however, similar effects of an aneurism have been observed in the thigh, and superior parts of the arm; even the bones of these parts having been found much affected by aneurismal swellings of the neighbouring arteries.

The appearance and termination of encysted aneurisms, are in general very nearly as is here represented: One exception, however, occurs in a particular species of the disorder, which will afterwards be more accurately described.

Various causes may be supposed necessary to the production of encysted aneurisms. 1. We know from daily experience, that partial debility frequently occurs in different parts of the system: Thus, there is nothing more common than œdematosus swellings of the extremities, even in constitutions otherwise healthy;

healthy; and swellings of this nature, we justly suppose to depend most frequently on a local weakness of the parts in which they occur. Now, why may not a debility of a similar kind fall upon part of the arterial system? and, if it should ever do so, we can easily see how in almost every instance it must necessarily terminate in aneurismal swellings: For the force of the heart continuing the same, if any particular part of an artery has lost its tone, as it is thereby rendered incapable of resisting the pulsations of the heart, a yielding, or dilatation of its coats, must at these weakened parts naturally ensue; and as soon as a morbid enlargement of its cavity is thus fairly commenced, as its power of resistance will of course proportionally diminish, while at the same time the *vis à tergo* still continues equally powerful, the farther increase of the swelling is a consequence that must necessarily ensue.

This cause of the disease may be considered as the most frequent origin of aneurisms

rism that do not evidently depend upon external injuries: All such swellings as occur in the course of the aorta, seem clearly to depend on this cause; as is in general the case, indeed, with all such as happen internally, in whatever part of the body they may be situated.

2. The external coats of an artery being destroyed by a wound with any kind of instrument, a partial weakness of the part will be thus produced; and this must render it liable to be acted upon to advantage, by the heart and other parts of the arterial system, in the same manner as if it had been previously debilitated by disease.

In dilatations of an artery produced by this cause, the disorder proceeds in the manner we have already described. The blood, from being still confined within the coats of the artery, continues to form a circumscribed tumor. In the beginning of the disease, the swelling is easily made to disappear upon pressure; but on advancing farther, part of its contents become so firm by coagulation, as to render it

it impossible to discuss it by any degree of pressure that can with propriety be applied. This species of the disorder may now and then occur from other causes, but it is most frequently produced by blood-letting in the arm; by the lancet, after having passed through the vein, going so deep as to divide the external coats of the artery.

3. A similar effect has been sometimes produced, by the matter contained in neighbouring sores and abscesses, proving so corrosive as to destroy the external coverings of the contiguous arteries: When this happens to occur, the same train of symptoms, it is evident, must succeed as if the outer coats of the vessel had been destroyed by a lancet or any other sharp instrument.

4. The bones, muscles, ligaments, &c. with which arteries are surrounded, all serve as a support to these vessels, so that it is not surprising, that the destruction of any of these parts should tend to the production of aneurisms; and accordingly
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instances have occurred, where affections of this kind seemed evidently to depend on such a cause: Indeed the firmness and stability of any set of parts naturally connected together, depends so much upon a sound state of the whole, that any one of them becoming weak and diseased, generally terminates in a diseased state of all or part of the remainder. In the thigh of a patient where part of the muscles and other soft parts had been destroyed by an extensive mortification, different aneurismal swellings occurred in the course of the femoral artery which had thus lost part of its support; and no other cause appeared to be concerned in their production.

5. In blood-letting at the usual place in the arm, it was already remarked, that arteries are sometimes wounded, by the lancet passing quite through the vein into the artery below; and when the artery happens to be directly in contact with the vein, the blood discharged from the orifice made in the artery, by passing directly into the vein, serves to keep up a communication be-

between the trunk of the one, and a principal branch of the other.

In this manner, a direct passage being produced between the artery and vein, and the coats of the latter not being sufficiently firm for resisting the impulse of the former, a preternatural dilatation of the vein is a consequence that must necessarily follow: A tumor accordingly is very soon produced, which is at first small and circumscribed, but by degrees it extends considerably both above and below the orifice; not only along the course of the vein originally wounded, but, on some occasions, all the veins lying contiguous come to be equally distended.

This species of the disease was first accurately described by that celebrated anatominist Dr William Hunter; and may with great propriety be termed the Varicose Aneurism. Since that period it has been frequently observed by different practitioners; so that its nature is now very generally understood.

Although the coats of the artery are here

here supposed to be all cut fairly open, so as to produce an immediate discharge of blood; yet by the blood being contained within the cavity of the veins, this species of the disease may with equal propriety be considered as encysted as any of the preceding; and as the treatment of it coincides much with that of other encysted aneurisms, the farther consideration of the subject could not, it was imagined, be any where more properly introduced.

In this species of aneurism, the swelling is confined entirely to the veins. Soon after the injury producing it has been received, the vein communicating immediately with the artery begins to swell: In a gradual manner, this enlargement becomes more remarkable; and when any considerable anastomosis occurs near to the part affected, between it and the contiguous veins, these also become much enlarged. By pressing upon this swelling of the veins, it may be made to disappear entirely, the blood contained in them being in part pushed forward in its course towards

towards the heart, while part of it may possibly be forced into the artery itself; and, when the tumor happens to be of a considerable size, the blood, when it is thus forced out of it, is heard to make a very singular hissing kind of noise. This, when it occurs, is a very characteristic symptom of the disease; but as it is not met with in every case, it becomes necessary to point out particularly, such circumstances as more certainly serve to distinguish this species of aneurism.

In the varicose aneurism there is a very singular tremulous motion discovered in the dilated vein, attended with a perpetual hissing noise as if air was passing into it through a small aperture. If a firm ligature be applied upon the under part of the limb, immediately below the swelling, and be tied so tight, as even to stop the pulse in the under part of the member, the swelling in the veins, on being removed by pressure, returns instantaneously on the pressure being taken off, and does not appear to be in any degree affected by the ligature

gature below; which it undoubtedly would be, was it not for the direct communication between the trunk of the artery and corresponding vein. The swelling being removed by pressing the blood forward to the heart, and a slight pressure being made with the point of the finger on the orifice in the artery, the veins remain perfectly flaccid, without any swelling whatever being produced, till the pressure is removed from the orifice, when they fill again immediately; and this even happens, altho' the pressure on the artery is not so firm as to stop the circulation in the under part of the limb.

In the same manner, too, if the trunk of the artery be compressed above the orifice, so as to stop the circulation effectually, that tremulous motion and hissing noise in the swelling of the veins ceases instantly; and, if the veins are now emptied by pressure, they will certainly remain so till the compression upon the artery is removed. On some occasions, too, it happens, that if two ligatures be applied, one an inch or

two above, and the other as much below the swelling, and are made so tight, as to stop entirely the circulation of the blood in the tumor lying between them; if the swelling is now compressed, all the blood contained in it is made to pass into the opening in the artery, from whence it instantly returns again on the pressure being removed. This, however, does not always happen; and its not doing so, is no proof whatever of that species of aneurism now under consideration not actually existing; for if all or several of the leading circumstances of the disease which we have just enumerated ever take place, the nature of the disorder is thereby rendered clear and evident.

In addition to the other characteristic symptoms of the varicose aneurism, it may be remarked, that when it has continued for any length of time, so as to have produced a considerable dilatation of the veins, the trunk of the artery above the orifice generally becomes preternaturally large, while the branches below become

proportionally small; and of consequence, the pulse in the under part of the member is always more feeble than in the sound limb of the opposite side.

The reason of this last circumstance is obviously this; that the blood, by finding a direct passage between the trunk of the artery and the principal branch of the corresponding vein, passes more readily in that way, than by the common course of circulation along the under part of the member; so that the quantity of blood sent to the inferior extremities of the artery being thus much diminished, the pulsation produced by it must of course become proportionally feeble: But why the superior part of the artery should be enlarged, by the blood passing thus so directly and easily from it into the vein, is a circumstance not so easily accounted for. The resistance to the blood passing through the artery, is by this direct communication between it and the vein very much diminished; and this has been suggested as the cause of the phenomenon. But this circumstance,

cumstance, of the resistance to the passage of the blood being thus diminished, we might more readily expect to have a very contrary effect. In other parts of the circulating system, we frequently find, that resistance to the passage of the fluids terminates in a dilatation of the containing vessels; and that swellings thus produced, can be removed by no other means than the removal of that resistance which first gave rise to them. Nothing that can be said upon this subject, however, will afford much satisfaction, as it is merely a speculative point; and as it can have no great influence on the practical treatment of the disorder, we shall not here attempt a farther investigation of it.

Having thus enumerated the ordinary appearances of the different species of encysted aneurism, together with the various causes which are found to produce them, we shall now proceed to describe the symptoms and causes of the diffused aneurism, and shall conclude with the treatment of the various species of the disease.

The Diffused, or what is commonly termed the False Aneurism, consists in a wound or rupture of an artery, producing, by the blood thrown out from it, a swelling, more or less diffused, in the contiguous parts.

Great bodily exertion has frequently proved an evident means of inducing a rupture of very considerable arteries seated internally: This we know to be particularly frequent in those of the lungs, probably from their being in that organ surrounded with such soft contiguous parts as do not afford them much support; and probably from the contrary reason, that here the arteries are more firmly supported, such accidents seldom or never occur in the external parts, where alone they could ever become the object of a surgeon's attention. We shall therefore confine our description of this disorder, entirely to that kind of it which we know to be most frequently produced by a wound made directly into an artery, and which it is commonly in the power of art to relieve.

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When treating of the consequences of venæsection in the arm, wounding the contiguous artery was particularly mentioned as one: In a few instances, by the treatment then pointed out, any bad effects which might otherwise occur from this circumstance, will be entirely prevented by the wound in the artery healing without any of the usual consequences being produced by it. Such happy terminations, however, of this accident, are exceedingly rare, and can never with any degree of certainty be depended on.

When a punctured artery resists the means employed for preventing the ordinary effects known to result from it, it will then for certain terminate in a swelling of the aneurismal kind; and the following is the usual progress of the disorder.

A small tumor, of about the size of a horse-bean, generally rises just at the orifice in the artery, soon after the discharge of blood has been stopt by compression: At first the tumor is soft, has a strong degree of pulsation, and yields a little upon

pressure. It is never, however, so compressible as the swelling of an encysted aneurism: For in the latter, except in the more advanced stages of the disease, the blood remains perfectly fluid, and there is a regular circulation of it through the whole cyst; whereas, in the diffused aneurism, the blood forming the tumor is at once extravasated; and as in that state it soon begins to coagulate, it is not long in acquiring a very firm degree of consistence.

In this state of the disorder, if the swelling be not improperly treated by the application of much pressure, it generally remains nearly of the same size for several weeks, when it begins gradually to increase; and if seated in the usual place of blood-letting in the arm, it proceeds rather farther up than the orifice, and extends rather more inwardly than towards the outer part of the arm, probably from the expansion of the biceps muscle not being there so firm and compact as in the external and under part of the arm.

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This enlargement of the tumor, too, proceeds with much more quickness in some instances than in others, and on some occasions the swelling is much more diffused and extended than in others.

Both these circumstances, it is probable, depend upon the same cause. If the blood poured out by an artery, is thrown into a very lax cellular substance, we can easily suppose, that its increase will not only be more rapid, but that the diffusion of the tumor must for the same reason be much more considerable, than when the artery is immediately enveloped by firm membranous or ligamentous parts, which do not so readily yield to the impulse of the blood. There is, from this circumstance alone, indeed, such a remarkable difference in the progress of the disorder, that in some instances swellings of this kind have been many months, nay even years, in arriving at any considerable size; and on the contrary, some instances have occurred of the blood from the orifice in the artery, being diffused over the whole

arm from the elbow up to the shoulder in the space of a few hours from the operation.

A particular laxity of cellular substance, has undoubtedly, in all such instances, a great influence in promoting this rapid diffusion of the extravasated blood; but the ordinary practice in every case of a wounded artery, of applying very tight compression, I am convinced, has also a very great influence in producing the same effect. In addition to what was said upon this point in the chapter on Blood-letting, I shall here just observe, that if it was possible to produce a moderate degree of pressure upon the orifice in the artery alone, some advantage might now and then perhaps be derived from it; but in order to apply a degree of compression sufficient for producing any influence upon the artery, the principal veins in the limb must by the same means be all so much acted upon, as to occasion much obstruction to the return of blood from the corresponding artery. And whatever tends in any degree

to obstruct the refluent blood, must in an equal proportion distend the wounded artery, and increase the quantity of blood which escapes by the orifice. Many machines have indeed been contrived for producing a partial compression upon the artery without affecting the rest of the limb: But however much these may have been extolled by their several inventors, yet none hitherto discovered answers the purpose of compressing the artery, without at the same time tending greatly to obstruct the circulation in the veins; insomuch that a great deal of mischief has on different occasions been produced by all of them.

Whoever inclines to have recourse to the use of these instruments, will find a variety of them delineated in Heister's System of Surgery, and in Dionis and Platner's works.

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surgeon

surgeon of his acquaintance, in which the bad effects produced by it were so strongly marked, as must convince any person of the general impropriety of such a remedy.

A surgeon having in blood-letting opened an artery, the usual method of tight compression was immediately employed. By this means the discharge of blood externally was very soon stopped: But some blood continuing to escape from the orifice in the artery, passed up towards the superior part of the arm, which it filled to such a degree, that on the operation for the aneurism, which was soon found necessary, being performed, upwards of four pounds of coagulated blood was discharged from it; and for this purpose it became necessary to lay the parts open along the whole course of the arm *.

When, again, compression has not been applied to such tumors, unless there is a very unusual degree of softness and laxity in the surrounding parts, the swelling proceeds to increase in a more gradual manner:

* Vid. Dionis's Course of Chirurgical Operations.

ner: As it becomes larger, it does not, like the true aneurism, become much more prominent, but rather spreads and diffuses itself into the surrounding parts: By degrees it acquires a very firm consistence; and the pulsation, which was at first considerable, always diminishes in proportion to this difference of consistence, and to the increase which the tumor receives in point of size; insomuch, that in large aneurismal swellings of this kind, it sometimes happens, that the pulsation of the artery is scarcely perceptible.

In the first stages of the tumor, if the blood thrown out from the artery lies very deep, the skin preserves its natural appearance, and does not change its colour till the disorder is much advanced. It frequently happens, however, that the blood is at first thrown out with so much violence, as to get into immediate contact with the skin; and when this occurs, the colour of the parts becomes instantly livid, as if tending to a state of mortification. A real sphacelus, indeed, has on some occasions

sions been induced where the extravasation of blood has been considerable, and where the means best suited for its removal have either failed or have been entirely neglected.

It must be considered, however, as a piece of unpardonable negligence, in any practitioner, to allow a patient, from this cause, to run that degree of risk which always attends mortification; for the hazard attending the operation of the aneurism, is in general trifling when compared with the danger accruing from an extensive gangrene.

As the tumor in this species of the disease proceeds to increase, the patient, who during the first stages of it did not complain of much uneasiness, is now much distressed not only with severe pains, but with stiffness, want of feeling, and immobility of the whole member: And these symptoms, continuing to augment, if the tumor is not previously operated upon, the teguments at last burst; and if the artery is of any considerable size, and if we have not

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immediate recourse to effectual means for preventing it, death must for certain ensue, in consequence of the very profuse hemorrhagy which must thus be produced.

Various causes were enumerated, as being frequently under certain circumstances productive of the encysted aneurism; some variety occurs too of causes which terminate in the diffused species of aneurism.

I. Violent bodily exertions may be considered as the most frequent cause of the rupture of arteries situated internally; but as these do not properly belong to a work of surgery, we shall not here enter at any length into their consideration.

II. The corrosive matter of sores and abscesses, by entirely destroying the coats of a contiguous artery, may in this manner be productive of the diffused aneurism.

III. The sharp spiculæ of a fractured bone being pushed into a neighbouring artery, have, on different occasions, produced aneurism.

IV. Violent blows have been known to produce aneurismal swellings of this kind.

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This, however, can scarcely happen in any other situation than on the head, where the arteries lie more exposed than in other parts to the effects of such injuries, by their being here very thinly covered, and from a blow in this situation acting with great advantage, by falling on the artery lying almost in close contact with a firm hard body, the cranium.

V. If the arterial covering of an *encycled* aneurism, should ever burst before the external teguments of the tumor, in that case the blood contained in it would diffuse itself into the contiguous parts; and in such an event, the disease would no doubt become a real *diffused* aneurism. Such an occurrence, however, we have reason to think, very rarely, if ever happens; for, instead of the *internal* coverings of such tumors first breaking, so far at least as I have had opportunities of observing, it is the very reverse. The swelling going on to increase in a gradual manner, the teguments at last become so tense and over-stretched, that they lose their tone entirely;

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the skin becomes soft and œdematos; on some occasions, it comes into a gangrenous state; and on others, although it retains its natural white colour, yet its usual powers are as evidently destroyed as they ever are in the last stage of mortification. In this state it generally remains for a longer or shorter space of time, according to the strength of the arterial pulsation below. At last, however, the skin begins to crack, and a thin serum oozes out; the edges of this small fissure in the teguments gradually separate from one another; and the contents of the tumor having lost a considerable part of their support, the force with which they are impelled, by degrees becomes too powerful for the remaining coverings, which accordingly soon burst, so as to discharge their contents externally, without producing any effusion among the neighbouring parts.

I should therefore suspect, that authors in general have all along been under some mistake on this point: The Encysted, or True Aneurism, as it is termed, has been
always

always supposed in its last stages to burst internally, and so to produce the diffused or false species of the disease; from what has been said, however, there is good reason to presume, if ever it does happen, that it is at least a very rare occurrence. The progress and termination of the encysted aneurism, in every case I have either seen, or known well authenticated, has been very nearly as we have just described; not by the arterial sac first bursting, but by a rupture being produced in the external teguments after they have been greatly over-stretched; the blood being soon thereafter discharged outwardly, without producing any effusion into the surrounding parts. As it has been alledged, however, by very respectable authors, that the contrary does now and then happen, and as there is a possibility of this being the case, I could not here avoid considering it as one of the causes of diffused aneurism.

VI. The most frequent cause, however, of this species of aneurism, are punctures with sharp instruments, such as swords, cutlasses, and

and particularly the lancet; which last may be considered as having been productive of at least nine-tenths of all the aneurismal swellings that ever occurred.

Under one or other of these heads, almost every circumstance may be comprehended, that can ever tend to the production of such affections.

On many occasions, it has unfortunately happened, that tumors of the aneurismal kind having been mistaken for abscesses and other collections of matter, their contents of course have been laid open by incision. The consequences of such practice may be more readily conceived than described. With a view to prevent such dreadful occurrences, it would be a matter of very great importance to practitioners, to have such a set of diagnostic symptoms of aneurism pointed out, as would with certainty determine the nature of the complaint. In the commencement of the disorder, there is in general no great difficulty in determining, as the

pulsation in the tumor is commonly so strong, and other concomitant circumstances tend so obviously to point out the nature of the disease, that little or no doubt respecting it can ever occur; but, in the more advanced stages of the disease, when the swelling has become very large, and has lost its pulsation entirely, nothing but a very minute attention to the previous history of the case can enable us to form a judgement of its nature.

Those swellings, with which aneurisms are most likely to be confounded, are, soft encysted tumors, scrophulous swellings, and abscesses containing either purulent or other matter, situated either immediately above, or so nearly in contact with an artery, as to receive the influence of its pulsation; and when any such tumor happens to be nearly connected with a artery of considerable size, the pulsation communicated to it is frequently found to be so very strong and distinct, as to render it impossible, from this circumstance alone,

alone, to form any just idea as to the nature of its contents.

But there is one symptom which, when present, and when connected with a strong pulsation in the tumor, may always lead us to determine with a great degree of certainty, that the swelling is of the aneurismal kind; and it is this; the contents of the tumor being made easily to disappear upon pressure, at the same time that they return instantaneously on the compression being removed. But although the presence of this circumstance, when connected with other characteristic symptoms of aneurism, may lead us to conclude, that every tumor *is of that nature* in which these happen to be combined, yet the want of it ought by no means to convince us that it is *not* of that kind; for it very frequently happens, particularly in the advanced stages of aneurisms, that their contents become so firm and compact that no effect whatever is produced upon them by pressure. Upon the whole, therefore, as in many instances of this disease,

no certainty whatever can be obtained as to its real nature, in all such cases where there is any considerable degree of doubt, practitioners ought to lay it down as an established rule, to proceed as if the tumor was in reality of the aneurismal kind. By adhering to this rule, they may perhaps in a few instances be deterred from opening tumors of an ordinary nature, which they may afterwards find might have been laid open with safety; but any lesser inconvenience that may thus be occasioned, will be much more than compensated, if, even in a single instance, a surgeon be saved from those disagreeable reflections which he must experience if he should have the misfortune to open an aneurism instead of a collection of matter.

But it is in the trunk of the body only, it must be observed, or in the neck, axilla, upper part of the thigh, or groin, that so much caution in the treatment of tumors of this doubtful nature can be ever necessary. For when situated on the under part of any of the extremities, or even

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on any accessible part of the head, as in such cases, when the swellings have proceeded to any considerable size, the operation for the aneurism ought always to be performed, so there can never in such circumstances be any impropriety in having recourse to it; for if, on laying the tumor open, it is found to be of the aneurismal kind, we are possessed of a very certain method of saving the patient from immediate danger, namely, the application of the tourniquet.

In forming a prognosis in cases of aneurism, three important circumstances chiefly require our attention. The manner in which the disease appears to have been produced: The part of the body in which the swelling is situated: And lastly, the age, and habit of body, of the patient.

If an anuerism has come forward in a gradual manner, without any apparent injury having been done to the part, and without having succeeded to any violent bodily exertion; there will then be great

reason to suppose, that the disease depends upon some paralytic or other general affection either of the trunk of the vessel in which it occurs, or perhaps of the whole arterial system; so that no great success is to be expected from any means to be attempted for the patient's relief; for the operation of the aneurism being performed on the part affected, there would be much reason to suspect that the same cause which originally produced it here will have the effect of producing similar dilatations in other parts of the artery: Whereas, there is great reason to expect, if the tumor has evidently succeeded to a bruise, puncture, or other external accident, that the operation will be attended with complete success, provided the circulation of the part is not altogether destroyed by the ligature to be put upon the artery.

In that species of the disorder we have termed the Varicose Aneurism, we may generally venture on a more favourable prognosis than in any other kind of aneurism: For it has been found in different instances,

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that the aneurismal tumor does not here proceed so rapidly as in other cases ; that as soon as it gets to a certain length, it does not afterwards acquire much additional size; and that any inconvenience produced by it may be sustained with tolerable ease for a great number of years.

It is in this circumstance alone, we must observe, that any advantage occurs in the treatment of aneurisms from Dr Hunter's discovery of this species of the disease: And a very important discovery it is ; for by means of it, a patient may be saved, not only from a very painful operation, but from that great degree of risk which must always attend the destruction of the principal artery of a limb. In the event of a swelling of this nature arriving at such a size as to produce much real distress, the operation ought no doubt to be had recourse to; but, so long as any inconvenience arising from it can be easily submitted to, the hazard which almost always attends this operation, and which nothing but ne-

cessity ought to indicate, should certainly be avoided *.

The situation of the tumor is the next circumstance of importance requiring our attention. When an aneurismal swelling is so situated, that no ligature or effectual compression can be applied for putting a stop

* In Volume II, Art. XXXVI. of London Medical Observations, two cases are related of the varicose aneurism, by Dr Hunter. One of them at that time was of fourteen years standing, and the other had subsisted for five years, without being productive of any necessity for having recourse to the operation. And in Vol. III. of the same work, Art. XIII. a similar case of five years duration is related by Dr Cleghorn.

As it has been alledged by some practitioners, that no advantage results from the discovery of this species of aneurism, from their supposing that the usual operation is as necessary in it as in any other variety of the disease; and as in different instances the operation has been put in practice even in the incipient stages of the disorder, where no real necessity we think could occur for it; it therefore becomes a matter of such importance as to merit a very attentive examination; and it is with much satisfaction that I communicate the following facts, as they tend to establish as a certainty, that in the varicose aneurism,

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stop to the circulation in the part, if the artery be large, there would be the utmost hazard

the usual operation of obliterating the cavity of the artery, is seldom, if ever, necessary.

In a letter I am favoured with from Dr Hunter, he says, "The Lady in whom I first observed the varicose aneurism is now living at Bath in good health; and the arm is in no sense worse, although it is now thirty-five years since she received the injury." And the Doctor farther observes, that he never heard of the operation being performed for the varicose aneurism that was known to be such.

In a letter from Dr William Cleghorn of Dublin, I am informed, that the case of varicose aneurism above-mentioned, as related in the 3d Volume of London Medical Observations, remains nearly in the same state as at the time that account of it was made out, which was at least twenty years ago; only that the veins are rather more enlarged. The patient recovered, and the limb became nearly as strong and serviceable as the other. The man has all along continued his business of shoemaker, and has lately recovered from a sprain in the affected arm, which he received in lifting a heavy burden.

In a letter from Mr Pott, whose opportunities for observation are great, he says that he has met with three different instances of this species of aneurism, and that the operation never became necessary in any of them.

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hazard in opening it; as the patient, in all probability, would lose more blood than his strength could bear, before the artery could be secured. In aneurisms so situated, therefore, particularly on any part of the trunk of the body, on the neck, axilla, or groin, there can never be any good foundation for a favourable prognosis. On the contrary, indeed, in such situations, the greatest danger is always to be apprehended: For the force of the arterial pulsation will at last certainly overcome the resistance of the coats with which the tumor is surrounded; and in such an event, the most fatal consequences are to be apprehended.

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Among other instances of varicose aneurism which have appeared here, a young man from Paisley, who had the misfortune to meet with it several years ago, was examined by different surgeons of this place. The disease was very clearly marked, and no operation was advised. In a letter from Mr Hamilton professor of Anatomy in Glasgow, I am informed, that this man is now serving in the Navy, where he undergoes great fatigue without any inconvenience from the aneurism, although it is now of thirteen years standing.

In the upper parts of any of the extremities, too, where all the arteries of the limb are centered in one common trunk, the success of the operation for the aneurism must always be doubtful. But although this is undoubtedly the case in the superior parts of the extremities, yet in lower situations of the same parts, even the principal artery of the limb may be operated upon with a very fair prospect of success; for after the great artery of a member has crept along the upper part of it, a number of small branches are always sent out, which anastomosing not only with similar branches below, but by their means with the under part of the large artery itself, these, in the event of the common trunk from whence they sprung being destroyed, come to dilate to such an extent as to carry on the circulation in the inferior part of the limb much more completely than could *à priori* be expected. We would not naturally suppose, after the principal artery of a part has been obliterated, that the circulation would there

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be afterwards carried on with any tolerable degree of force; and yet numberless instances have occurred of the large brachial artery being completely destroyed by ligature, without being productive of much inconvenience to the parts below; and the same circumstance has also happened, where the operation for the aneurism has been performed on the trunk of the great femoral artery *.

From what has been said, therefore, it must

* In one case, the operation for the aneurism was performed with the most complete success, on the trunk of the femoral artery, about two hand-breadths from the groin, by the late Mr Hamilton professor of Anatomy in Glasgow. And what rendered this case more remarkable, was, that after the trunk of the large artery was secured by the ligatures, it was necessary to perform the operation again upon a small branch of an artery which had been wounded, even farther up than the principal trunk.

For some time after the operation the limb remained colder than the other, and it was upwards of a week before any pulsation could be felt in the artery at the ankle. In two months from the operation, the wound was completely healed, and the circulation and heat returned;

must appear, that when an aneurism is so situated, that compression cannot be applied so as to secure the patient from the loss of much blood when the artery is laid open, the operation should not be attempted; and in such cases the prognosis ought certainly to

returned; and in a short time thereafter, the patient had so far recovered the use of his limb, as to be able to take very violent exercise.

These particulars I thought it right to communicate, as the case of this patient is one of a very few well authenticated instances, of this operation having been attempted on the femoral artery so near to its origin; and the success attending it surely points out the propriety of having recourse to the operation, in every aneurism of these parts that does not evidently arise from a general debility of the coats of the artery. And as I am favoured with this account of the case from the present professor of Anatomy in Glasgow, Mr Hamilton, son to the late professor, its authenticity may be depended on.

In Vol. III. Article XII. of the London Medical Observations, there is another instance related of the operation for the aneurism having been performed on the trunk of the femoral artery, by Mr Burchal surgeon in Manchester; the patient recovered, and the limb became nearly as strong and as serviceable as the other.

to be very unfavourable. And on the contrary, whenever an aneurism, produced by external violence, is seated on any of the extremities, where we are sure of commanding the circulation, the operation ought always to be undertaken, as soon as from appearances, there is the least reason to suspect that the tumor if left to itself might burst so as to endanger the life of the patient.

The success of this operation, depending in a great degree upon the probable chance there is for the circulation afterwards going on in the under part of the member, our prognosis, in every case of aneurism, ought, *cæteris paribus*, to be more or less favourable, according as the disorder is seated higher or lower on the different extremities: For the risk of the circulation being hurt by it, is always in proportion to the height of the tumor; according as it is higher or lower, this risk is always increased or diminished.

But lastly, whether an aneurism has been produced by an external injury, or by the effects

effects of internal disease, and whatever may be its situation, the habit of body and age of the patient ought to have a considerable influence, in determining the opinion of practitioners as to the effects to be expected from the operation. In no operation, indeed, that we are acquainted with, are the advantages derived from health and youth more conspicuous than in this; for in the earlier periods of life, all the softer parts accommodate themselves much more readily to the circumstances attending any great change that may take place, than they ever do in the more advanced stages of life: In old age, all the animal fibres have acquired such a degree of firmness and solidity, as to be rendered almost incapable of distension; and this seems to be particularly the case with the arterial system, some parts of which are often known to proceed even to a state of ossification: So that at this period of life, we may readily suppose the smaller arteries to be rendered altogether incapable of that degree of distension necessary for supplying the want of the principal artery
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of a part, and which in the more early periods of life they might with great ease have admitted of.

This operation having been performed with various degrees of success, even where the aneurismal tumors were apparently in every respect similar both as to situation and other circumstances, various reasons have been suggested to account for this. With some the operation has succeeded, even under circumstances apparently more unfavourable, than with others where it failed. Thus it has been known to answer, as we have lately remarked, several inches above the knee, when the trunk of the femoral artery was for certain taken up by the ligature; and in others, it has failed when done in the ham: That is, in the former, the circulation in the under part of the leg was still preserved, and the patients recovered; while in the latter, where success might more readily have been expected, the limbs remained cold after the operation, no return of circulation took place, mortification at last was induced, and the patients died.

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From this variety of success attending it, we find very contradictory opinions held forth respecting this operation. While one condemns it as being never productive of any good, except in the very extreme parts of a member; others assert, that even the largest artery of a limb may be operated upon with great probability of success.

This contrariety of opinion, however, may, I think, be easily explained, by what has been said above respecting the age and habit of body of those on whom the operation is performed; for, to the different powers of distention with which the arterial system is endowed at different periods of life, the good or bad success attending it may with sufficient reason be attributed: So that, although in an old infirm person, it may have been found to fail perhaps in the under part of the leg or arm, this should by no means deter us from having recourse to it, even in much higher situations, by patients that are young and healthy.

Having thus considered the usual appear-

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ances and causes of aneurism, together with the grounds upon which a just prognosis is to be formed, we shall now proceed to the method of cure.

SECTION II.

Of the Treatment of Aneurisms.

IN every case of aneurism the use of pressure has been indiscriminately recommended, not only in the incipient period of the disease, but even in its more advanced stages. In a former chapter on Blood-letting, as well as in some parts of this, different opportunities occurred for introducing the consideration of this subject: To these we must now refer; and shall at present attend to such points only as were not before so particularly entered into.

In the diffused or false aneurism pressure has been universally advised, not only with a view to dissipate the swelling already induced, but in order to produce a reunion of the wound in the artery: We have already made it appear, however, as pressure in such cases cannot be applied to

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the artery alone, without at the same time affecting the veins; and as this circumstance, by producing an increased resistance to the arterial pulsations, must undoubtedly force an additional quantity of blood to the orifice in the artery, that therefore no advantage is to be expected from it; but, on the contrary, that on many occasions there is reason to suppose it has been productive of bad consequences.

But although pressure ought never to be attempted in any period of the diffused aneurism, yet in some stages of the other species of the disease, it may be often applied with advantage.

In the early stages of encysted aneurism, while the blood can be yet pressed entirely out of the sac into the artery, it often happens, by the use of a bandage of soft and somewhat elastic materials, properly fitted to the part, that much may be done in preventing the swelling from receiving any degree of increase; and on some occasions, by the continued support thus given to the weakened artery, complete cures have been at last

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obtained. In all such cases, therefore, particularly in every instance of the varicose aneurism, which we have already endeavoured to show can very seldom require the usual operation, much advantage may be expected from moderate pressure.

But although pressure to a certain degree has frequently in cases of encysted aneurism proved very useful, it ought never to be carried to any great length; for tight bandages in all such affections, by producing an immoderate degree of reaction in the containing parts to which they are applied, instead of answering the purpose for which they were intended, have evidently the contrary effect. Moderate compression, therefore, is more eligible than a great degree of it; and indeed the greatest length to which pressure in such cases ought to go, should be, to serve as an easy support to the parts affected, and no farther.

While at the same time we have recourse to this remedy of compression, other means ought not to be omitted: The patient should be kept upon a low diet; when necessary,

cessary, some blood should be evacuated; the bowels should be kept lax; and all violent exercise, particularly of the part affected, should be carefully guarded against. In the latter stages of aneurism, when much tension and pain are induced, opiates are found very useful; and in many such ailments they are the only class of remedies from which any relief is obtained.

The treatment here recommended applies to every aneurism not intended to be operated upon; but it is particularly proper in all swellings of this kind situated on the trunk of the body and other parts where the operation is inadmissible. In such situations, indeed, an easy support by means of gentle compression, a low diet in order to prevent a plethoric state of the vessels; repeated blood-lettings when plethora actually exists; a total abstinence from exercise; and the use of opiates when indicated by pain; are the only remedies from which much benefit is to be expected.

Having thus pointed out the different remedies to be employed where the opera-

tion is either not considered as proper, or where it is rendered inadmissible by the situation of the swelling, we shall now proceed to describe the operation itself, on the supposition of its having become necessary, either when the means recommended for the previous treatment of the disorder have failed, or when the tumor has made too great progress before proper assistance was procured.

The first step in this operation ought to be, to obtain a full command of the circulation in the inferior part of the member by means of the tourniquet applied above.

This being effected, the patient should be so placed, that the diseased limb, on being stretched on a table, is found to be of a proper height for the surgeon, who, as the operation is generally tedious, ought to be seated. The limb being in this situation properly secured by an assistant, the operator is now with a scalpel to make an incision through the skin and cellular substance, along the whole course of the tumor; and as it is a matter of much importance to have a sufficient command of space

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for the remaining parts of the operation, it is even of use to carry this external incision about half an inch both above and below the extremities of the swelling: No mischief can occur from the first incision being made very free and extensive; and I have seen different instances of the operator being much embarrassed in the subsequent steps of the operation, by too much timidity or perhaps ill-judged lenity in this part of it.

This being done, the ordinary method is, to proceed in a very slow, cautious manner, dissecting away one layer of the membrane after another, till the artery itself is laid bare. In this manner the operation is always rendered exceedingly tedious, as the thickness of parts with which the artery is found covered, is often really astonishing, by one layer of a membranous substance having been formed after another, from the coagulable lymph of the blood contained in the tumor. In reality, however, there is no necessity for this degree of caution, as the operation may in the following manner be equally well performed,

in a much shorter space of time, and with much less pain to the patient.

As soon as the external incision has been made in the manner directed, so as to divide the skin and cellular substance, all the effused blood ought to be wiped off by means of a sponge ; and the softest part of the tumor being discovered, an opening ought there to be made into it with a lancet, large enough for admitting a finger of the operator's left hand. This being done, and the finger introduced into the cavity of the tumor, it is now to be laid open from one extremity to the other, by running a blunt-pointed bistoury along the finger from below upwards, and afterwards from above downwards, so as to lay the whole cavity fairly open. In Plate VII. fig. 1. there is an exact representation of this bistoury, with a curve much less than usual, as a very slight concavity answers every purpose, and cuts more easily than a greater degree of curvature.

The cavity of the tumor being thus laid freely open, all the coagulated blood is

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now to be taken out : For which purpose, a number of instruments, particularly scoops, have been invented by different operators; but no instrument answers this intention so effectually, and with so much ease to the patient, as the fingers of the operator; who having in this manner removed all the coagulated blood, together with those tough membranous filaments commonly found here, the cavity of the tumor is now to be made quite dry, and cleared of the blood which on the first opening of the swelling is discharged into it from the veins in the inferior part of the member; and this being effectually accomplished, the tourniquet must be made perfectly slack and easy, in order to discover not only the artery itself, but the opening into it from whence the blood collected in the tumor has been all along discharged. This being done, the next point to be determined, is, the manner of preventing any farther effusion of blood into the aneurisimal sac. Various means have been proposed for accomplishing this;

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but the effects of all of them may be comprehended under the three following heads.

I. The effects of ligature upon a large artery, having in some instances occasioned the loss of the inferior part of the member, it was long ago proposed, that so soon as the opening into the artery has been discovered, instead of applying a ligature round it, which for certain is to obliterate its cavity entirely, a piece of agaric, vitriol, alum, or any other astringent substance, should be applied to the orifice, in order if possible to produce a reunion of its fides.

II. Upon the same principle with the preceding, viz. that of still preserving the circulation in the artery, it was several years ago proposed by an eminent surgeon of Newcastle, Mr Lambert, that the orifice in the artery should be secured by means of the twisted suture. A small needle being pushed through the edges of the wound, they are then directed to be drawn together by a thread properly twisted round

round the needle, in the manner formerly advised when treating of sutures*.

Strong objections, however, occur to both of these methods. In the first place, no astringent application with which we are acquainted, is possessed of such powers as to deserve much confidence; for, although different articles of this kind have on various occasions proved a means of putting a temporary stop to hemorrhages, yet there are very few instances properly authenticated, of their having produced any permanent advantage. In almost every instance in which they have been used, the hemorrhagy has recurred again and again, so as to prove very distressing not only to the patient, but to the practitioner in attendance; so that from this want of success, little or no attention is now paid to remedies of this kind in ordinary practice.

With regard to Mr Lambert's method of stitching the orifice in the artery, it is certainly

* Vide London Medical Observations, Vol. II. Article XXX.

certainly a very ingenious proposal, and would in all probability, at least in most instances, prove an effectual stop to all farther discharge of blood; but as it has hitherto, at least so far as I have heard, been only attempted in one instance, farther experience of its effects is necessary before it can with propriety be either rejected or approved. But if in such a matter reasoning may be indulged, we would beg leave to observe, that two material objections occur to this practice. One is, that in the operation for the aneurism, in almost every instance, a very few only excepted, the artery lies at the back part of the tumor; so that when all the collected blood is removed, there is such a depth of wound, that it must be always a very difficult matter, and on many occasions quite impracticable, to perform this nice operation upon the artery, with that attention and exactness which, in order to insure success, it certainly requires. It has now and then happened indeed, that in this operation the artery

artery has been found to be on the anterior part of the tumor, and in such a situation the wound in it would no doubt prove accessible enough. This, however, is a very rare occurrence, as in almost every instance of diffused aneurism the artery lies at the very bottom of the tumor, the blood being collected between it and the common teguments; and accordingly I have seen several instances of this disorder, in which, after the tumor was laid freely open, the artery was found to lie so deep as would have rendered it quite impossible to perform this operation.

But there is another very material objection which *a priori* evidently occurs to the practice recommended by Mr Lambert. By introducing a needle through the sides of the orifice, and drawing these together by a ligature, the cavity of the artery must undoubtedly be at that point much diminished. Indeed Mr Lambert, in his account of the case in which this operation was performed, acknowledges that the diameter of the artery was thereby diminished.

minished. Now, the passage of the blood being thus contracted at one point, the impulse upon that particular part must be very considerable: So that the very remedy employed for the cure of one species of aneurism, will in all probability prove a very powerful agent in inducing another; for the blood being thus obstructed in its usual course, there will be no small danger incurred, of a dilatation being produced immediately above this preternatural stricture.

I must fairly acknowledge, however, that all I have advanced, proceeds from reasoning alone, and is not as yet supported by experience. But, if farther trials of this operation tend to show that the objections now stated against it are not well founded, no person whatever will be more ready than I shall be in adopting it; for, if these objections were removed, this operation, as proposed by Mr Lambert, I should consider as deserving to be ranked among the most important improvements which in modern times surgery has acquired. In
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the treatment of aneurism by the common operation, if the principal artery of a limb is concerned, some risk is always incurred, not only of injuring the parts below in a most material manner, but even of destroying them entirely, by depriving them of the quantity of blood necessary for their support. Now, by Mr Lambert's improvement, an effectual stop is put to the farther evacuation of blood, while at the same time the circulation in the diseased artery is still preserved ; so that if farther experience of its effects shall show that the objections we have ventured to bring against it are not well founded, it will deservedly be admitted as a very material improvement in the treatment of this species of aneurism.

III. Neither of the methods we have yet been considering, being found eligible for securing the orifice in the artery, we shall now proceed to describe the ordinary manner of performing this operation, which consists in obliterating the arterial cavity

cavity entirely, by means of ligatures; and the method of doing it is this.

The artery being laid bare in the manner directed, and all the coagulated blood being carefully removed from the cavity of the tumor, on the tourniquet being now slackened so as to bring the orifice in the artery into view, a small probe is to be introduced at the opening, with a view to raise the artery from the neighbouring parts, so as that the surgeon may be enabled with certainty to pass a ligature round it without comprehending the contiguous nerves, which in general run very near to the large blood-vessels of a limb. By this precaution, the nerves may be always avoided; and by doing so, a great deal of mischief may be prevented, which otherwise in all probability might supervene. When the disorder is situated either in the ham, or in the usual place of blood-letting in the arm, bending the joints of the knee or of the elbow, as it relaxes the artery a little, renders this part of the operation more easily effected, than when

when the limbs are kept fully extended.

The artery being thus gently separated from the contiguous parts, a firm, broad, waxed ligature must be passed round it, about the eighth part of an inch above the orifice, and another must in the same manner be introduced at the same distance below it. Much harm, I am convinced, has been done by passing the ligature so far distant from the orifice as is commonly practised; for the risk of losing the benefit of anastomosing branches will be always increased in proportion to the extent of artery included between the ligatures.

The easiest method of introducing the ligatures, is by means of a blunt curved needle; and the form represented in Pl. V. fig. 2. will be found more convenient for this purpose than any other. An ordinary sharp needle is commonly made use of for this purpose; but it does not answer the intention so well as the one here recommended: By the sharpness of its point it is apt to injure the contiguous parts; and

when the common crooked needle is used with a sharp edge on its concave side, there must even be some risk of its wounding the under part of the artery, as in this situation it cannot be introduced without making part of the needle pass quite in contact with the coats of the artery. The blunt needle is not liable to either of these objections; and besides, when of the form here represented, it is more easily introduced than any of the needles commonly used in this operation.

The ligatures being both passed in the manner directed, the upper one is now to be tied with a firmness sufficient for compressing the sides of the artery. The directions formerly given for forming the knot upon bleeding-vessels in other parts, will apply with equal propriety here: The ends of the ligature ought by all means to be twice passed through the first noose, and this should again be farther secured by a single knot made above it. By many writers on this subject, a small bolster of linen is ordered to be inserted between the artery
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and the knot, in order to prevent the artery from being cut by it. This, however, is a very unnecessary precaution; for if the whole artery is not surrounded with the bolster, it will be just as liable to be cut by the ligature at any other part as where the knot is fixed: And besides, as we have already very fully remarked, there is no occasion whatever for making the ligature so tight on arteries as to run any risk of dividing them; a much less degree of pressure than is either commonly applied, or could have any influence in hurting them, being fully sufficient for compressing them in the most effectual manner.

The upper ligature being thus finished, before the knot is passed upon the other below the orifice, the tourniquet ought to be untwisted, in order to see whether any blood is now discharged by the wound in the artery or not. If blood flows in any considerable quantity, it affords a pleasant prospect of the success with which the operation will in all probability be attended, as it clearly shows, that the anastomosing

branches from the superior part of the artery are considerable enough for carrying on at least a tolerable degree of circulation in the under part of the member. At the same time, however, although blood should not be discharged at this time by the orifice, we are by no means, from this circumstance alone, to despair of success; for it frequently happens that the operation succeeds in a very effectual manner, although no blood whatever is discharged on the trial now recommended.

But whether any blood should be discharged by this trial or not, we are not to rest satisfied with one ligature; for unless the ligature below the orifice be also tied, there is always a risk, on the return of circulation to the under part of the artery, of blood passing out at the orifice: This precaution, therefore, should never be omitted; it is easily done, and it renders the patient quite secure against all farther evacuation of blood by the orifice. After the knots have been put upon the ligatures, these should be cut off such a length that their

their ends may lie fully out over the edges of the wound, so that when necessary they may be more easily withdrawn.

By way of greater security in this operation, it has been advised to insert other two ligatures quite contiguous to the former, and to leave them untied, so that if any of the others should happen to fail, its place may be immediately supplied.

There is not, however, any necessity for this precaution, for, if the first ligatures are properly applied, there can be no doubt of their answering the purpose; and in case either one or both of them should give way, they can be very easily renewed: In the mean time, too, the patient is rendered safe against any sudden loss of blood by the tourniquet being left loose upon the upper part of the member, which it ought by all means to be for several days after the operation, so that, in the event of blood bursting from the wound, it may be secured by means of it, much more readily than if it depended on the tying of a ligature.

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The ligatures being both finished in the manner directed, the tourniquet is now to be made quite loose ; and if no blood is discharged at the orifice in the artery, we may then rest satisfied that the operation is so far properly completed.

The wound is now to be lightly covered with soft lint, with a pledget of any emollient ointment over the whole ; and a compress of linen being applied over the dressings, all the bandage in any degree requisite, is, two or three turns of a roller above, and as many below the centre of the wound, making it press with no more tightness than is absolutely necessary for retaining the applications we have just now mentioned.

The patient being now put into bed, the member should be laid in a relaxed posture upon a pillow, and ought to be so placed as to create the least possible uneasiness from the posture in which it is laid.

As the operation for the aneurism is always tedious, and produces much pain and irritation, a full dose of laudanum should be given immediately on the patient being

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got into bed. In order to diminish sensibility during some of the more capital operations, I have made different trials of opiates given about an hour before the operation: On some occasions, this proved evidently very useful; but on others, it seemed to do harm; particularly in weak, nervous constitutions, in which with any doses I ever ventured upon, the patients appeared to be rendered more irritable and more susceptible of pain, than if no opiate had been given. Immediately after this operation, however, an opiate ought to be exhibited, and repeated occasionally according to the degrees of pain and restlessness.

In some few cases of aneurism it has happened, that the pulse in the under part of the member has been perceptible immediately after the operation. This, however, is a very rare occurrence: For as this disorder is seldom met with in any other part than at the joint of the elbow as a consequence of blood-letting, and as it rarely happens that the brachial artery divides till it passes an

inch or two below that place, the trunk of this artery is therefore most frequently wounded; and when accordingly the ligature in this operation is made to obstruct the passage of almost the whole blood that went to the under part of the arm, there cannot be the least reason to expect any pulsation at the wrist, till in a gradual manner the anastomosing branches of the artery have become so much enlarged, as to transmit such a quantity of blood to the inferior part of the member, as is sufficient for acting as a stimulus to the larger branches of the artery.

Immediately after the operation, the patient complains of an unusual numbness or want of feeling in the whole member; and as it generally for a few hours becomes cold, it is therefore right to keep it properly covered with warm soft flannel; and in order to serve as a gentle stimulus to the parts below, moderate frictions appear to be of use. In the space of ten or twelve hours from the operation, although the numbness still continues, the heat of the parts

parts generally begins to return ; and it frequently happens in the course of a few hours more, that all the inferior part of the member becomes even preternaturally warm.

Although physiological discussions are not immediately connected with our subject, and although for that reason we shall not often enter into them ; yet we cannot here avoid remarking the very clear proof which after this operation always occurs, of the great dependence one part of the human frame has upon another. The nerves we know to be the instruments of sense and motion ; but on being deprived of their usual support from the sanguiferous system, their influence immediately diminishes.

Immediately after this operation, the want of feeling in the parts is often very great ; and in proportion as the circulation in the under part of the member becomes more considerable, the degree of feeling also augments. If we could suppose the nerves of the parts below to be always included in the ligature with the artery, that numbness

ness which succeeds immediately to the operation, might be easily accounted for; but I have known it happen, when I was certain that nothing but the artery was secured by the ligature: And besides, although the knot upon the nerves would account for the immediate loss of sensibility which succeeds to the operation, it would not in any degree serve to explain the return of feeling on the circulation being again restored; for the nerve having been destroyed by the effects of the ligature, if the want of feeling produced here originated entirely from that circumstance, it could not be expected to be much influenced by the return of blood to the part.

In the mean time the patient being properly attended to as to regimen, by giving him cordials and nourishing diet when low and reduced, and confining him to a low diet if his constitution is plethoric, the limb being still kept in an easy relaxed posture, towards the end of the fourth or fifth day, sometimes I have known it much sooner, a very weak feeble pulse is discovered

discovered in the under part of the member, which becoming stronger in a gradual manner, the patient in the same proportion recovers the use and feeling of the parts.

As soon as there is an appearance of matter having formed freely about the sore, which will seldom happen before the fifth or sixth day, an emollient poultice should be applied over it for a few hours, in order to soften the dressings, which may be then removed. At this time, too, the ligatures might be taken away; but as their continuance for a day or two longer can do no harm, it is better to allow them to remain till the second or third dressing, when they either drop off of themselves, or may be taken away with perfect safety. The dressings, which should always be of the softest materials, being renewed every second or third day according to the quantity of matter produced, the sore is in general found to heal very easily; and although the patient may for a considerable time complain of a great degree of numbness and want of strength in the whole course

course of the diseased limb, yet in most instances a very free use of it is at last obtained.

It will be readily supposed, that the termination of this operation as we have here described it, is the most favourable that can possibly happen. In some instances, the success attending it is far from being so complete : Instead of a return of circulation, and of the feeling and use of the parts, they remain cold and insensible, and no marks of returning life are perceived. From a mere want of blood, therefore, mortification at last commences ; and as nature is here deprived of one of her principal agents for the removal or separation of gangrenous parts, I mean the efforts of the sanguiferous system, whenever the parts in such circumstances begin to mortify, nothing can prevent their progress to the ultimate stage of that malady.

Whenever mortification ensues, therefore, as a consequence of this operation, if the patient survives the immediate effects of it till a separation occurs between the healthy and

and diseased parts, amputation of the member will then be the only resource.

That this operation when practised upon the principal artery of the superior part of a member, does now and then terminate in this manner, no practitioner of experience will deny; but its doing so in some instances, is not a sufficient reason for rejecting it in every case. The event of every capital operation we know to be very uncertain; and in this, as in every other of equal importance, as we cannot in any case say with precision how it is to answer, so we are never to put it in practice where means of a less hazardous nature will succeed: And on the contrary, whenever these are found to fail, and the patient's life comes to be in danger, it ought undoubtedly to be performed without farther hesitation.

C H A P. V.

Of Herniae.

SECTION I.

Of Hernia in general.

THE term Hernia might with propriety be applied, to every swelling occasioned by the dislodgement of parts from those boundaries within which in a state of health they are contained; but the term in its general acceptation, implies, a tumor produced by the protrusion of some part or parts from the cavity of the abdomen.

The parts in which these swellings usually appear, are the groin, scrotum, labia pudendi,

pudendi, the upper and fore part of the thigh, the umbilicus, and different points between the interstices of the abdominal muscles.

If the situation of such tumors be various, the viscera which they contain are still more so; instances having occurred of the stomach, uterus, liver, spleen, and bladder, being found to form their contents. But a part of the intestinal canal, or a portion of the omentum, are from experience known to be the most frequent cause of their formation.

From these circumstances of situation and contents, all the different appellations are derived by which herniæ are distinguished. Thus they are termed Inguinal, Scrotal, Femoral, Umbilical, and Ventral; from their appearing in the groin, scrotum, thigh, navel, or belly. When the tumor is confined to the groin, the hernia is said to be incomplete, and is termed Bubonocele; but, when the swelling reaches down to the bottom of the scrotum, the rupture is then supposed to be complete,
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and the disease obtains the name of Scrotal Rupture, or Oschiocèle.

When a portion of gut alone forms the tumor, it is called an Enterocele, or Intestinal Hernia; when a piece of omentum only has got down, it is termed Epiplocele, or Omental Hernia; and if both intestine and omentum are down, it is called an Entero-epiplocele, or Compound Rupture.

As all the abdominal viscera are apparently contained within the cavity of the peritonæum, and as it was thought impossible for that membrane to admit of such a degree of distention, as to surround tumors containing such large portions of the different viscera as are at times protruded, it was therefore commonly supposed, that in at least the greatest number of cases of hernia, the peritonæum must certainly be burst or ruptured; and from this the term Rupture was in all such instances supposed to be applied with propriety enough. The idea was farther confirmed too, from its having been observed, that in cases of scrotal hernia, the protruded vis-

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cera were in some instances found in contact with the testicle; a circumstance, which it was supposed could not possibly happen, if the peritonæum had not been previously ruptured.

Since the anatomy of these parts, however, was better understood, this circumstance, of parts protruded from the abdomen being on some occasions found in contact with the testicle, is explained in a more satisfactory manner than on the supposition of a rupture of the peritonæum; an occurrence which we suppose will very rarely happen, in any other manner than from external violence: But as the nature of these disorders cannot be properly understood without a previous knowledge of the anatomy of the parts concerned, it will be proper, before proceeding farther, to describe such as here become the more immediate subjects of operation; and these are, a part of the abdominal muscles; the peritonæum; testicles; and spermatic vessels.

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of the abdomen are formed by five pairs of muscles; viz. the recti, pyramidales, transversales, obliqui interni, and obliqui externi.

In some subjects, the pyramidales are wanting; and as the obliqui externi are in general those which in cases of hernia come to be most connected with the disorder, we shall here confine our description to the anatomy of these only.

The obliqui externi are two thin, broad muscles: on their posterior and upper parts they are fleshy; and tendinous on their anterior and lower parts. They originate from the eighth, ninth, and inferior ribs, by fleshy portions which intermix in a serrated manner with corresponding parts of the latissimus dorsi, serratus major anticus, pectorales major, and intercostales: And afterwards becoming tendinous, they form the greatest part of all the anterior surface of the abdomen, and are inserted into the linea alba, the spine of the os ileum, and into the os pubis. On each side of the under part of the abdomen

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men immediately above the pubes, two openings are met with in these tendons, intended for the passage of the spermatic vessels in men, and for the ligaments of the womb in women. These openings, or rings as they are termed, which seem to be formed merely by a separation of the fibres of the tendon from one another, are of an oval figure, and have an oblique direction from the spine of the ileum downwards; they are somewhat wider above than below, and are rather of a larger size in men than in women.

Although these rings or openings have been commonly described as passing thro' not only the external oblique, but the transversales and internal oblique muscles also; yet it is now certainly known, that it is in the tendinous parts of the external oblique muscle only, that any such opening exists. It is of some importance to the student to be thoroughly acquainted with this circumstance: for, by the accounts received of it from books, one is led to suppose, that, instead of one distinct passage, there

are always three to be met with here. These muscles are likewise perforated in the middle by the umbilicus, which affords a passage for the connecting vessels between the mother and uterine foetus, and which is continued through life, being filled up by cellular substance only.

From the inferior border of the tendinous part of the external oblique muscle, a detachment of fibres is sent off, which, after affording a firm covering to the inguinal glands, are lost in the fascia lata of the thigh: And the under edge of this tendon being folded inwards, obtains the appearance of a ligament, which stretches from the fore part of the os ileum to the pubes, forming a kind of arch, through which pass the great blood-vessels of the lower extremity. It is this ligamentous like portion of the external oblique muscle, which is known by the appellation of Poupart's or Fallopius's ligament.

This passage for the blood-vessels of the thigh, being larger in women than in men, owing to the greater size of the pelvis in
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the former, by which the arch formed by Poupart's ligament is rendered both longer and wider; so in them the crural hernia, or that species of the disease formed by a protrusion of parts through this passage, is found to occur much more frequently than in men.

The internal surface of the muscles of the abdomen, together with every other part of that cavity, is lined with a smooth somewhat elastic membrane, termed Peritonæum. This membrane, besides lining the cavity of the belly, furnishes the external covering to almost every viscus contained in it; but, in so singular a manner are these coverings produced, that altho' at first sight the different viscera appear all to be contained within the cavity of the peritonæum, yet on a minute examination they are in reality found to lie behind it.

The peritonæum, after having completely lined the cavity of the abdomen, is continued or reflected over all the viscera, so as to give an external covering to each. After surrounding one viscus, it stretches

along to the most contiguous, forming in its course the supporting membranous ligament of the liver and other viscera; and affording in its duplicature a kind of support or connection to the various blood-vessels, as they stretch along to their destined situations in the intestinal canal and other organs.

Behind the peritonæum lies a quantity of loose cellular substance, by authors commonly termed its Appendix. In some parts this substance is filled with fat; and in others it is empty, and can easily be filled with air.

The testes in the fœtus are, till near the period of delivery, lodged in the cavity of the abdomen, in the same manner with the rest of the abdominal viscera. They are situated immediately below the kidneys, on the fore part of the psoæ muscles, near to the upper end and by the side of the rectum, where their external covering adheres by its posterior surface to those parts of the peritonæum on which they rest, while all their anterior and lateral surfaces lie

lie loose in the abdominal cavity in contact with the other viscera. Even in this situation, however, a connection takes place between the testes and scrotum. This is formed by means of a substance which runs down from the under end of the testis to the scrotum, forming a kind of pyramidal shaped ligament; its large bulbous head being fixed to the lower end of the testis and epididymis; and its under extremity, after having passed through the ring in the external oblique muscle, being lost in the cellular membrane of the scrotum. This ligament is evidently vascular and fibrous, and seems in part to be composed of the cremaster muscle turned inwards *.

All that portion of the ligament contained within the parietes of the abdomen passes behind the peritonæum, and receives a covering from it in the same manner with the testes and other viscera; and the peritonæum even gives a coat to a portion of

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* See a very accurate account of the Anatomy of these parts by Mr J. Hunter, in Dr Hunter's Medical Commentaries.

the ligament after it has got into the groin, by passing down along with it from the abdomen into the upper part of the inguen.

At this place, viz. at the annular opening of the external oblique muscle, the peritonæum is very loose; and when the ligament and scrotum are drawn downwards, an aperture is observed from the cavity of the abdomen all around the fore part of the ligament, which seems ready to receive the testis; and this aperture gradually becomes larger as the testis descends behind the peritonæum in its way to the scrotum. While the testicle is ready to descend, it does not fall down, as has been commonly imagined, along the fore part of the peritonæum, between it and the other viscera; but this ligament we have now described as lying behind the peritonæum, and which is connected with the testis at its under and posterior parts, by directing or pulling it down as it were from behind, brings it in this manner along the psoas muscle between it and the peritonæum; and that part of this membrane to

to which we have shown 'that the testicle adheres, being necessarily drawn along with it, a kind of pouch or bag, somewhat resembling the finger of a glove, is thus formed by this elongation of the peritonæum; the under extremity of which still continues to surround the testis as it goes along, in the same manner as it did when that viscus rested upon the psoas muscle; and the entrance from the abdomen to the cavity of this process, is exactly at that point where the testis was originally situated; for it is there that this process commences when the testis begins to descend.'

The peritonæum being in a fœtus remarkably lax and dilatable at this part, and being connected posteriorly, as we have seen, with a quantity of very loose cellular substance, its elongation produced by the descent of the testicle is in this manner provided for by nature, and of course is easily admitted of.

It must not, however, be supposed, that the testis and peritonæum in coming down

fall

fall loosely and without connection ; for, as they slide down very gradually, they still continue to adhere to the parts lying behind them as they did when in the abdomen.

The precise time at which the testis passes down from its original situation in the abdomen, cannot be exactly determined ; but in general, this change takes place about the eighth month. About this period, the testis surrounded with the peritoneal process, moves downwards till its under extremity comes into contact with the most inferior point of the abdominal parietes ; and by this time the passage through the tendon of the external oblique muscle is found a good deal enlarged, by the ligament of the testis having sunk downwards so as to produce a considerable dilatation of it.

After the testis has passed the tendon of the muscle, it commonly remains for some time by the side of the penis, and by degrees only descends to the bottom of the scrotum ; and even when it has got entirely into the scrotum, its ligament is still connected

nected with it, and lies immediately under it, but is shortened and compressed.

The process of the peritonæum, which we have shown to descend with the testicle, continues to cover it when it has reached the scrotum: and it is this loose covering or bag which is afterwards converted into what Anatomists term the *Tunica Vaginalis Testis*; and from the description we have given of it, it is evident, that the cavity of this bag must at first communicate with the great peritoneal cavity of the abdomen. This it accordingly does, as a probe may be passed readily and easily along this process or bag, from the belly down to the bottom of the scrotum; and if it be laid open through its whole length on the fore part, it will be plainly seen to be a continuation of the peritonæum; the testis and epididymis will be found at the lower part of it without their loose coat the tunica vaginalis; and as the spermatic vessels and vas deferens, while the testicle remained in the abdomen, entered the body of it behind, and between the reflected lamina of the

the peritonæum, so here when in the scrotum they will be found covered by the posterior part of the bag, in their whole course from the commencement of that process down the groin to the testicle.

This passage from the cavity of the abdomen to the scrotum is in general very soon cut off, by a firm adhesion being produced between the sides of the peritoneal process at its upper extremity where it descends from the abdomen. What the cause of this adhesion may be, is uncertain; perhaps it may proceed from some slight degree of inflammation being excited upon the contiguous parts by the forcible passage of the testis; but whatever the cause may be, the fact is, that at the time of birth this passage in general is completely obliterated.

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* The descent of the testes from the abdomen is a phenomenon very difficult to account for, and its immediate cause may probably always remain a mystery; but their being in almost every instance found in the scrotum before birth, is a clear proof of their not being forced down by the effects of respiration, as has been commonly supposed.

It is in the neck only, however, or superior part of this process, that such an adhesion takes place; as the lower extremity of the sac remains open and loose through life, and forms, as we have already said, the tunica vaginalis testis: the common seat of a hydrocele.

If the smallest attention be given to this description, it must appear evident, that if immediately upon the testicle descending from the abdomen, and before the passage is sufficiently contracted, any portion of the alimentary canal or omentum should likewise fall into the opening, such parts must for certain lodge in the same bag or covering with the testis itself; and that as long as they remain there, they must effectually prevent the usual obliteration of the passage from being accomplished.

It is this occurrence, of a portion of some of the abdominal viscera getting into the tunica vaginalis testis, which forms that species of hernia to which new-born infants are liable, termed by Haller the

Hernia

Hernia Congenita. The testicle and protruded intestine being here in contact with one another, the tunica vaginalis testis forms the hernial sac.

If the gut, or other parts which have fallen down, be again pushed into the abdomen, and are retained there by proper bandages or any other means, in that case the passage is soon closed up, and no return of the disorder is observed. But this being neglected, and the gut being allowed to remain long down, the parts forming the passage seem thereby in a great measure to lose that power of adhesion which naturally they are known to possess; instances of such cases having occurred where no art has been able to produce this wished-for obliteration of the opening.

The hernia congenita is usually produced in the manner now described; it is probable, however, that the same disorder may, and frequently does, occur, from this passage between the abdomen and testicle, after having been once closed, being again rendered pervious, in consequence of the parts

parts being over stretched by those violent fits of coughing, crying, and other convulsive affections to which children soon after birth are now and then liable. The intestinal canal and other viscera, being on such occasions pushed with violence against all the containing parts, these will most easily give way where the least degree of firmness occurs; and this we may readily suppose will most probably happen in such parts as have been most recently united. In this manner it is probable that the greatest proportion of those cases of hernia are produced which occur in the early months of infancy; and I am even inclined to think, that on some occasions in more advanced periods of life, the same species of hernia may likewise occur from the same cause.

It is evident, then, in what manner the hernia congenita is produced; we shall now inquire into the causes which tend to the production of hernia in its more usual form.

I. The containing parts of the abdomen
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we know to be elastic and compressible; whatever, therefore, tends to produce a diminution of capacity in the cavity of the abdomen, must occasion a proportional degree of risk, of some of the contained parts being pushed from their natural situations. Violent coughing, crying, laughter, or great bodily exertion, are attended with more or less contraction of the abdominal muscles, and particularly of the diaphragm; and as the contraction of these muscles, must always diminish the abdominal cavity, these causes therefore are frequently found to be productive of hernia.

II. Falls, in consequence of the derangement they produce in the abdominal viscera, from the sudden and violent shock with which they are often attended, are not unfrequently the immediate causes of hernia.

III. Persons of a preternatural laxity of frame, are very liable to hernia. The containing parts of the abdomen, from the want of a sufficient tone and firmness, are unable

unable in such people to resist on all occasions the weight of the different viscera; and they are therefore more particularly exposed to disorders of this kind on the slightest application of any of the causes already mentioned.

IV. Sprains are apt to induce a laxity of the part injured; and have therefore a similar influence in inducing herniæ, with general laxity.

V. It has been observed, that the people of those countries where oil is much used as an article of diet, are particularly liable to herniæ.

In whatever parts the parietes of the abdomen happen to be weakest, these various causes will most readily operate in producing herniæ; and accordingly we find, that descents of the bowels usually occur only in such parts.

The parts which from anatomy we would *a priori* suspect to be most liable to such protrusions, are, the openings already described in the external oblique muscles; the arch formed by Poupart's ligament for

the passage of the great blood-vessels of the thigh; and the umbilicus, where the same degree of firmness does not take place as is met with in the rest of the tendinous expansion of the abdominal muscles.

These, as we have already said, are the usual seats of hernia; but it sometimes happens that parts of the viscera are protruded between the interstices of the different muscles of the abdomen. These, however, are not frequent occurrences.

In whichever of these situations a protrusion of any portion of the intestines occurs, except in the case of the hernia congenita, as all the viscera are contained in the manner already described within the peritonæum, a portion of that membrane, it is evident, must be carried down together with the parts protruded; and in every such instance, it is this portion of the peritonæum which goes down along with the gut that is termed the Hernal Sac. The size of this sac is various in different subjects, and in different stages of the same disorder.

On the first appearance of the disease, the sac is commonly of no very considerable size, as such swellings seldom acquire any great bulk at once: But by repeated descents of the bowels, the sac comes to be pushed lower and lower, till in some instances its bulk becomes very considerable indeed; and when in this advanced period of the disorder the sac happens to be laid open, it is found to contain either large quantities of omentum or intestine, and frequently large portions of each.

As the peritonæum has this property in common with many other parts of the body, of thickening according to the degree of any gradual extension applied to it, so in many instances the thickness and firmness of the hernial sac are often really astonishing.

Although every instance of a bowel protruded from its natural situation is to be considered as a derangement, and as such demands our attention, yet daily instances occur, both of recent herniæ, and of those of longer standing, in which no bad symptoms

toms are produced by such protrusions of the viscera. Thus it is well known, that hernial swellings of every kind very frequently happen, without the patient suffering in any other manner, than from the inconvenience arising from the bulk of the tumors. But in general this is otherwise ; troublesome symptoms most frequently occur ; and at all events, when the reduction of a hernia can be accomplished with any kind of propriety, it ought always to be effected as quickly as possible.

All the bad symptoms which are found to occur in herniæ, proceed, as may be readily supposed, either from obstruction to the passage of the feces when the intestinal canal forms the tumor, or from a stoppage of circulation occasioned by stricture on the prolapsed parts ; so that the attending symptoms, it is evident, will be always more or less hazardous, according to the nature of the parts so protruded.

Thus, when a portion of the omentum alone

alone forms the substance of hernial swellings, as that organ does not appear to be so immediately necessary to life as many of the other viscera, such tumors accordingly are not so frequently productive of bad consequences, at least they are seldom in any degree so hazardous, as when a part of the alimentary canal is either protruded by itself, or along with omentum.

Although this, however, is in general the case; yet it does sometimes happen, that even an omental rupture is productive of no small degree of danger. When a stricture so complete upon it occurs, as to occasion a stoppage of circulation in the protruded part, mortification with all its bad consequences must be the certain event: And besides, the connection between the omentum, stomach, and other viscera, is such, that a sudden descent of any considerable portion of the former sometimes brings on vomiting, hickup, and other troublesome symptoms: And lastly, although a rupture containing omentum only, might not of itself produce 'any thing' bad; yet as the

passage through which the omentum has slipped, must of necessity continue open as long as that viscus remains protruded, and as that circumstance alone must as long as it continues render it more easy for a portion of gut likewise to get down, this of itself is a sufficient reason for bestowing even upon this species of hernia our serious attention.

But whatever the contents of such swellings may be, as their remaining in some instances for a considerable length of time without being productive of any bad symptoms, must proceed entirely from the circulation continuing to go freely on, notwithstanding the derangement of parts; so, whenever a stricture occurs upon the protruded viscera, sufficient to produce either a stoppage of the circulation, or of the fæcal contents of the alimentary canal when a portion of gut forms the disease, the following in general are the symptoms which accrue.

An elastic colourless swelling is observed at the part affected; a slight pain is felt, not

not only in the swelling itself, but, if part of the alimentary canal is down, an universal uneasiness is perceived over the whole abdomen; and this pain is always rendered worse by coughing, sneezing, or any violent exertion. The patient complains of nausea; frequent retching; can get no discharge by stool; becomes hot and restless; and the pulse is commonly found quick and hard.

If the swelling is entirely formed by a portion of gut, and if no feces are contained in it, it has a smooth, equal surface; and is easily compressible, but instantly returns to its former size on the pressure being removed. But, in gut ruptures of long standing, where hard feces have collected in the protruded bowels, considerable inequalities are detected.

When again the tumor is composed both of gut and omentum, its appearance is always unequal, it feels soft and somewhat like dough, and of course is not so elastic as when part of the intestinal tube only is down; for although like the other

it is compressible, it does not so readily regain its former dimensions on the pressure being taken off.

It has been a received opinion, that in cases of strangulated hernia, the symptoms should be less violent when the intestine is accompanied by a portion of omentum, than when gut alone is down. Little or no difference, however, is produced by this circumstance; for when a gut becomes obstructed and inflamed, the symptoms thereby induced are nearly the same whether the omentum be down with it or not.

It will be readily supposed, however, that the symptoms we have described never can happen from the presence of omentum only; For although stricture produced on a portion of omentum, even when no part of the intestinal tube is down, does now and then occasion a good deal of distress, such as pain in the part, sickness, vomiting, and twitching pains through the whole belly; yet no obstruction of the gut ever occurs from this, and of course none of the symptoms ever prove

so alarming as when any part of the gut is concerned.

If these symptoms we have described as being produced by a strangulated gut, are not now obviated by a removal of the stricture which produced them, the nausea and retching terminate in frequent vomitings, first of a bilious, and afterwards of a more fetid matter; the belly becomes tense; the pain turns more violent; a distressing convulsive hickup comes on; and the fever, which before was not apparently of much consequence, now becomes very formidable, and a total want of rest with a very disagreeable state of anxiety continues through the whole course of the complaint.

These symptoms having gone on with violence for some time, the patient is at last for the most part suddenly relieved from all manner of pain, when he flatters himself every risk is for certain over. But instead of that, the pulse, from having been hard and frequent, becomes languid and interrupted; cold sweats break out

out over the whole body, but especially on the extremities; the eyes acquire a kind of languor; the tension of the abdomen subsides, and the swelling of the part affected disappears; the teguments covering the parts, which before were either of a natural appearance, or had somewhat of a reddish inflamed cast, now acquire a livid hue, and a windy crepitous feel is distinguishable all over the swelling.

If the protruded parts have not of themselves gone entirely up, their return is now in general easily effected by a small degree of pressure, and the patient then discharges freely by stool; but the cold sweats increasing, the hickup turns more violent, and death itself is at last ushered in by its usual fore-runners, subsultus tendinum and other convulsive twitchings.

These are the ordinary symptoms of what is termed a strangulated or incarcerated gut hernia; that is, when the parts protruded become so affected by stricture, as to produce pain; and do not either return to their natural situations on the patient getting into

into a horizontal posture, or cannot even be immediately replaced by the hands of a practitioner.

In whatever situation a strangulated hernia occurs, the only rational method of cure, it is evident, must consist in the removal of that stricture which prevents the return of the protruded parts. It is that which ought to be considered as the cause of all the mischief; and unless it be removed, nothing effectual can be done for the relief of the patient.

Various methods have been attempted by practitioners for the removal of stricture in these disorders; all of them, however, may be comprehended under two general heads.

I. Such as effect a reduction of the protruded parts, without the interposition of incision or any chirurgical operation properly so called; and,

II. A division of the parts producing the stricture, so as to admit of a replacement of the deranged viscera, constituting what is termed the Operation for the Hernia.

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The remedies to be employed for accomplishing the first of these, are, a proper posture of the patient, with the manual assistance of a practitioner; blood-letting; stimulating glysters; opiates; the warm bath; and proper applications to the tumor itself.

As soon as the assistance of a practitioner is desired for the removal of symptoms in cases of hernia, the first circumstance requiring his attention, is, the placing his patient in such a posture as will most probably favour the return of the protruded parts. Thus, when the tumor is in the groin, or in the fore-part of the thigh, the patient ought to be so placed, as to raise his thighs and legs considerably higher than his head and trunk; that is, he should be placed almost perpendicularly upon his head.

This position causes almost the whole quantity of intestines to hang or swing by the protruded parts, which frequently proves a means of effecting their reduction. Placing the patient's feet over the shoulders of another person, while at the same time

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his body is allowed to hang downwards, and causing him in this posture to be a good deal jolted about, has on some occasions been known to answer when every other means has been tried in vain.

For the same reason that in the inguinal and femoral hernia the position now mentioned is more advisable than any other, the usual erect posture of the body becomes most proper in cases of exomphalus or umbilical rupture; and again, a horizontal posture is most likely to prove serviceable in cases of ventral hernia.

While the patient thus remains in the most suitable posture according to the seat of the disorder, the surgeon should at the same time endeavour to assist the return of the gut or other parts, by means of gentle pressure with his hands and fingers. In the inguinal or scrotal hernia, this pressure should be made obliquely upwards towards the os ileum, so as to correspond as nearly as possible with the opening in the external oblique muscle. In the femoral hernia, the pressure ought to be

be made directly upwards; in the umbilical hernia, downwards and backwards; and in the ventral hernia, directly backwards.

When tumors of this nature are of any considerable size, pressure, as we have here recommended, is most conveniently made, by grasping the swelling with one hand from the bottom upwards, while with the fingers of the other hand we endeavour to push forward the contents at the superior part of the tumor. Some surgeons, in pushing forward the intestine, employ the fingers of both hands at the upper part of the tumor; but the same purpose is answered equally well with the index and middle finger of one hand, while the other hand is employed to great advantage in pressing the under part of the tumor upwards so as to co-operate in this manner in the reduction of the parts. It is this operation which by authors is termed the *taxis*. No description, however, can convey an adequate idea of the manner of performing it properly: for, like many other circumstances in the art of surgery, the knowledge

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of it can only be acquired by repeated experience and attentive observation: But this must always be had in view, that any pressure that is applied, must be of the most gentle kind; for every thing of this nature that creates much pain, is very prejudicial, and ought by all means to be avoided.

If a very moderate degree of pressure applied in the manner described, does not effect a reduction of the tumor, other means must be immediately employed. Blood-letting is here a principal remedy. In no disorder is it either more indicated from appearances, or affords more relief in reality. The quantity to be taken away ought in a great measure to be determined by the strength of the patient: But if in any case we can with propriety, venture upon abstracting large quantities of blood from weak people, it is here; and it is often astonishing to what length this evacuation is carried in cases of hernia without being productive of any prejudice to the system. A state of deliquium being known to produce a more effectual relaxation of the va-

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rious muscular parts of the body, than can be obtained by any other means, it has sometimes been advised, in cases of hernia, to take off such large quantities of blood, and in such a sudden manner, as to produce fainting; and the practice has now and then been attended with advantage.

As an obstinate costiveness is commonly one of the most alarming symptoms of hernia, it has been a common practice to prescribe not only a variety of stimulating purgatives by the mouth, but injections composed of the most acrid materials. From all the experience, however, which I have had in disorders of this nature, I am convinced that purgatives are very seldom productive of much good; and when they do not prove useful, they almost universally do mischief, by increasing not only the sickness at stomach which always prevails here, but even by adding to the pain and tension of the tumor. I am clear, therefore, that remedies of this kind should not be pushed so far as they commonly are; and when they are applied, instead of purgatives



BRITISH MUSEUM

Plate VI.

Fig. 4.

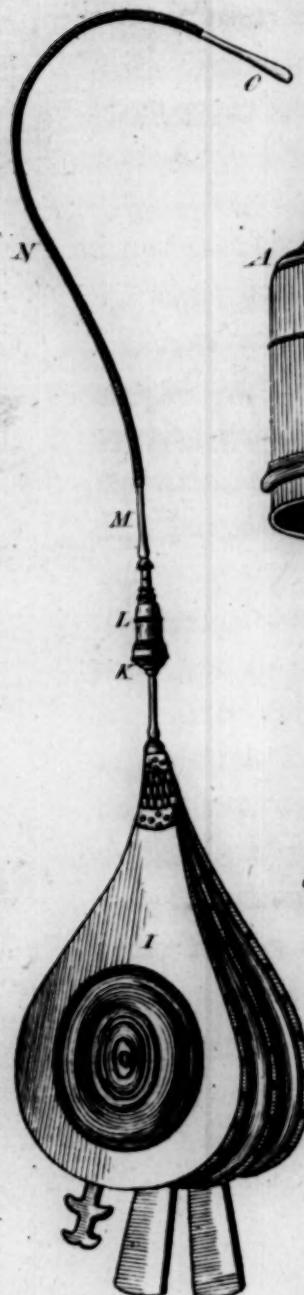


Fig. 1.



Fig. 3.



Fig. 2.



A. Bell. Sculp.

tives by the mouth, which always prove very nauseating, and in this state are usually rejected by the stomach, I would recommend tobacco-smoke thrown up in the form of injections, as preferable to every other remedy. A variety of machines have been contrived for injecting smoke by the anus; but none of them I have met with answer the purpose either so easily or so effectually as the instruments represented in Plates VI. and VII. They are easily procured; and by means of either of them, smoke may be injected with any necessary degree of force.

I would not have it supposed, however, that I recommend tobacco-smoke used in this manner as an infallible purgative, as many have done. For the contrary is certainly the case; I have known it used in a great number of cases both of hernia and ileus, and seldom with any advantage. I only advise it as the most effectual remedy of this kind with which I am acquainted; and I know that the method here recommended of injecting it, is the

most effectual hitherto invented. It has been objected to these instruments we have delineated, that we cannot when they are employed ascertain the quantity of smoke injected. But this is a nicety of little importance; as the rule in all such cases should be, to continue to throw up the smoke, either till it has produced the wished for effect, till a considerable degree of sickness is induced, or till the abdomen is found to be somewhat distended by it, as in some patients a third or even a half more may be necessary for this purpose than is found to answer in others.

But although this remedy does not frequently answer as a purgative, it often, both in cases of hernia and ileus, proves a very effectual anodyne. And as we are frequently in such cases deprived of the advantage of opium, by its being rejected by the stomach, in such instances, when the pain is very severe, it may be always employed as one of the best means of procuring ease.

With the same view as the remedy last
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Plate VII.

Fig. 2



Fig. 1.

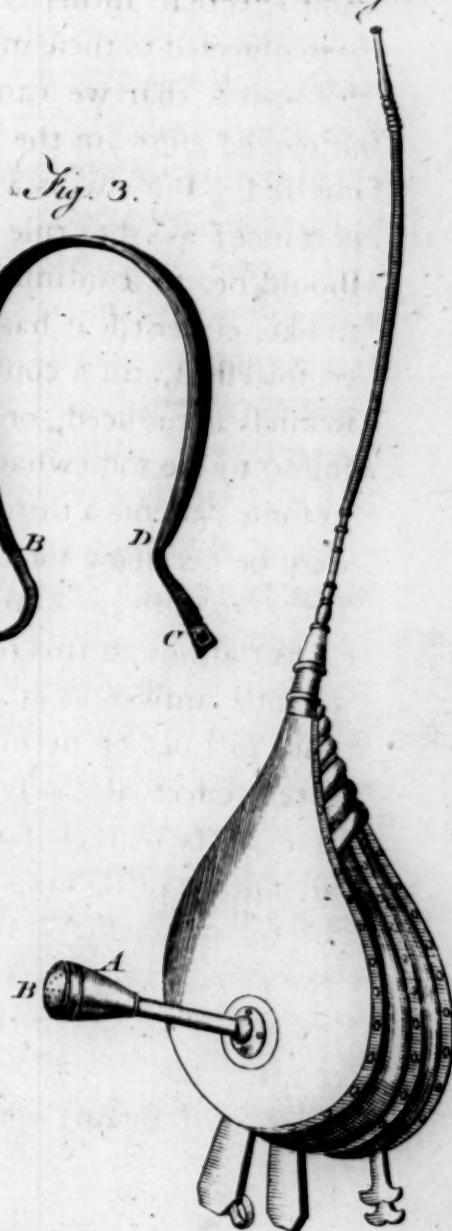
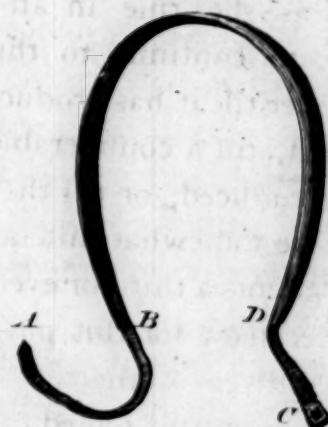


Fig. 3.



A Bell. Sculp!



mentioned, acrid suppositories, composed of soap, aloes, and other stimulating materials, have been recommended; and when remedies of this class are to be used, these may be considered as a necessary addition to the other purgatives; but no great dependence ought ever to be placed upon them.

I know, we are told that in some cases of hernia, the use of drastic purgatives has been of advantage; but I have so frequently known them do harm, by increasing the nausea, pain, and inflammation of the strangulated gut, that I am under no difficulty in saying that they ought seldom, if ever, to be used in any case of hernia.

Opiates are here often of service, not only by relieving pain, but as tending to relax those parts which, by being preternaturally constricted, we consider as the principal cause of the disorder. We have already observed, however, that the constant retching which occurs in most cases of hernia, prevents the exhibition of opiates by the mouth; but in such instances they may be applied with some advantage in

the form of injection, and their use may be alternated with that of tobacco-smoke as we have above recommended.

Warm bathing is another remedy from which much advantage has been received in disorders of this nature. It is not the local application of heat, however, in the form of poultices and fomentations, &c. we mean to recommend, but the universal warm bath, in which the whole body is immersed, and which we know to be possessed of very relaxing powers.

The latter, viz. the general warm bath, by tending to relax the constriction on the protruded intestines, has frequently had a considerable influence in promoting their replacement; but the former, viz. poultices and other means of applying local heat to the swelled parts, although commonly employed, are undoubtedly very prejudicial. On the constricted tendon they can have no influence, for it always lies so deep as to be out of the reach of every local application of this nature: And as the heat conveyed by such remedies, must for certain tend to rarefy

rarefy the contents of such swellings, by their thus producing an increase of size in the tumors to which they are applied, instead of answering any good purpose, on this principle it is evident they must do harm; and accordingly, whoever will attentively observe their effects, will find this to be the case. When the external teguments are much inflamed and painful, by their emollient properties they now and then afford some relief; but the ease so obtained is only momentary, as the pain commonly soon becomes more violent than before they were employed.

Whoever attentively considers the nature of these disorders, and the means generally found most effectual in relieving them, will probably coincide with us, in imputing the bad symptoms which occur in cases of hernia, to a stricture induced upon the protruded parts. By many, however, a contrary opinion has been inculcated: and the principal cause of the various symptoms which occur here, has been supposed to be, inflammation, or some

spasmodic affection of the protruded parts, independent of any stricture of the parts through which these have passed.

That inflammation of the prolapsed bowels, whatever may originally have produced it, will in general terminate in all the symptoms of strangulated hernia, no person will deny; but that stricture of the surrounding tendons is by much the most frequent cause of them, we think is so very obvious, as to render it quite unnecessary here to adduce any arguments in support of the opinion: This, however, we must remark, that even on the supposition of the origin of all the mischief lying in the protruded parts themselves, and not in any stricture of those through which they pass, still the impropriety of warm applications must be equally obvious, as by the rarefaction they induce, they must always tend to produce an additional degree of swelling in the contents of the hernial tumor.

Independent, however, of any theoretical reasoning, I can with certainty aver, that in practice, much more advantage is obtained

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in disorders of this kind, from cooling applications, than from those of an opposite nature. In different instances I have ventured on the application of ice and snow, sometimes with evident advantage, and I never saw them do harm *. But in general, the remedies I depend most on here, are, cold saturnine solutions, and cloths kept constantly moist with a mixture of cold water and vinegar.

By a proper application of one or other of the remedies now mentioned, or by a due combination of all of them, many cases of hernia are relieved without any farther assistance: But it frequently happens, notwithstanding every endeavour, that the protruded parts cannot be returned; the symptoms, instead of abating, become more violent; and the event of the disease is of course rendered more doubtful.

In this situation, when no probability remains of success from the employment

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* By some writers, this practice has been considered as hazardous; but I find it recommended by others to whom much credit is due, particularly by the late Dr Monro. See his works, 4to edition, p. 559.

of the means already mentioned, the division of the parts producing the stricture is then our only resource.

This, it may be remarked, is one of the nicest points in practice that a surgeon has ever to determine upon : I mean the exact period at which, in cases of hernia, the more gentle means should be laid aside, and the operation be put in practice. If a surgeon, without having given a full trial to all the usual remedies, should early in the disorder proceed to the operation, and if unfortunately it should not succeed, he would probably be blamed by the friends of the patient as the principal cause of his death ; and again, even allowing a recovery to be obtained, he is apt to be blamed, not only by his brethren of the profession, but by the patient himself, for having made him suffer an unnecessary degree of pain.

In such a situation a practitioner often finds himself much embarrassed. But we ought to be directed here, as in every critical case we are employed in, by the result of experience only ; and if this rule is adhered

hered to, instead of tedious delays usual in every case of strangulated hernia, we will have recourse to the operation much earlier than is usually done.

This operation, as is the case indeed with every other of equal importance, is no doubt attended with some hazard; but the danger accruing from it has by most practitioners been more magnified than it ought to be: For although no person of character can in any case of hernia be supposed to have recourse to it before other means have been tried; yet so far as from experience I am able to judge, the risk attending the disorder itself when the operation is long delayed, is infinitely greater than is commonly experienced from the effects of the operation considered abstractedly.

Were we able from the attending symptoms to determine the exact period at which the operation ought to be performed, no kind of difficulty would occur from it; but this is so far from being the case, that the most experienced practitioner cannot with any certainty decide upon it. In
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some instances, herniæ with every symptom of strangulation, continue for six, eight, or ten days; and after all, the protruded parts are at length replaced, and the patient does well; and in many similar cases when the operation has been the means of relief, although the very worst symptoms have subsisted for several days, yet on laying the parts open, no appearances either of inflammation or gangrene have been detected.

On other occasions, again, the same set of symptoms, with perhaps no greater degree of swelling or tension in the parts affected, end fatally in a very short space of time. In some such instances, the rapid progress of the disorder is very surprising; the space of eight-and-forty hours hardly intervening, from its first attack till the patient's death: I have even known the intestines become perfectly gangrenous in the course of one day from the time of their first expulsion.

Every practitioner must be sensible, that this is the real state of the question; and if it

it is so, it must at once become evident, that considerable delays must in such critical circumstances be always attended with great hazard; and as the real danger to be apprehended from the operation itself, is trifling when compared to the risk which long delays usually produce, it ought therefore, I think, to be laid down as an established maxim, Always to proceed to the operation, if in the space of a very few hours blood-letting and the other remedies pointed out, do not prove effectual. Two or three hours at farthest, even when the assistance of practitioners is early applied for, is perhaps the greatest length of time that should ever be consumed in trials of this nature.

In the treatment of herniæ, it is certain, that French surgeons are usually more successful than the generality either of German or British practitioners; and so far as I know, no reason can be assigned for the difference, but that the French in almost every instance proceed more early to the operation than the surgeons of almost any other

other nation. They will thereby, no doubt, perform it frequently on patients who might have recovered by more gentle means; but any inconvenience arising from this circumstance to a few, is fully compensated by the number of lives which must be saved by having recourse to the operation in due time, and which in all probability would otherwise have been lost.

Although for very obvious reasons the reduction of every case of hernia ought to be attempted when that can be done with propriety, yet it frequently happens that particular circumstances occur which effectually debar us from every resource of this nature.

When once a hernial swelling has been properly reduced, it is in general in the patient's power to prevent any return in future, by keeping a proper bandage constantly applied to the opening from whence the parts were protruded. But it often happens from inattention to this circumstance, that ruptures which might at first have been easily cured, come at last by repeated

repeated descents, and by the great quantity of parts that fall down, to form tumors of so great a magnitude, in proportion to the opening through which they were protruded, that no art can replace them by the more simple means of reduction.

Independently, too, of the great degree of bulk to which tumors of this kind sometimes arrive, such adhesions frequently take place, between the viscera forming the swelling and the surrounding parts, as render their return altogether impracticable by any other means than by the operation. By this last mode, indeed, almost every case of hernia may be reduced; but however necessary this operation may be when a patient's life is in danger, as it is always attended with some degree of risk, it ought never to be put in practice where symptoms of strangulation do not actually exist.

In that chronic state of hernia we have been just describing, although by interested and ignorant practitioners the operation has been often proposed as a radical cure,
yet

yet no surgeon of character would in such circumstances ever think of advising it: He would rest satisfied with preventing any accumulation of feces in the intestines, by prescribing a proper diet and the occasional use of gentle laxatives; and with obviating any inconvenience which might arise from the weight of the tumor, by the application of a proper suspensory bandage.

By these means alone, large tumors of this kind are often rendered very supportable for a great length of time; the circulation of the parts contained in the swelling goes freely and regularly on, as well as the peristaltic motion of such parts of the alimentary canal as have been protruded; and hence it is that we have many instances of large portions of the gut falling down even to the bottom of the scrotum, and continuing there for a great number of years without producing any interruption whatever to the usual discharge by stool.

In this situation, therefore, of the disease, the operation can never become admissible.

But

But although people labouring under this state of the complaint, do frequently enjoy very good health, and sometimes feel little or no inconvenience from the swelling, yet it must not be supposed that their situation is altogether free from danger: On the contrary, it is very certain, that on many occasions, swellings of this kind which have subsisted for a great length of time without being productive of much trouble, do at last inflame and turn painful, so as to produce every bad symptom commonly observed from the real strangulation of a gut. As long, too, as a swelling of this nature remains, as the opening through which the parts have been protruded is thereby effectually prevented from closing, so the patient is always liable to descents of other portions of intestine which have not formerly been down, and which may be productive of the most fatal symptoms. But what we here wish to establish is, that till once these bad symptoms do actually occur, either from an affection of that part of the gut which has been
long

long down, or of a portion more recently protruded, no such operation as the one in question ought to be employed. All that can be done with propriety in such cases, is, to fit the patients with proper suspensory bandages; to warn them of the risk they are constantly liable to; and to caution them against violent exercise, particularly leaping, and every sudden exertion.

Although with regular practitioners this circumstance cannot require much discussion, yet the public at large is much interested in it. The former know well, that the operation should not be performed in any case of hernia where violent symptoms do not render it necessary; but the latter, by not being able to judge of the various circumstances which ought to be taken into consideration, are too frequently imposed upon by that numerous set of Itinerants with which every country abounds. By these a variety of operations are put in practice for performing what they call a radical cure of these disorders; by which they

they mean to say, a prevention of future descents.

But as no remedy with which we are acquainted, a well adapted truss only excepted, can be depended on for this purpose; and as all the other means put in practice for it, are not only painful, but in general are productive of much danger; the magistracy of every community ought to interfere in suppressing them.

The object in view by every attempt of this nature, is, either to effectuate the entire destruction of the hernial sac, or at least to procure an accretion of its sides; which, by such as are ignorant of the anatomy of the parts concerned, has been considered as capable of preventing any returns of the disorder in future; and for the production of which, various methods have been invented.

In order to effect a total destruction of the sac, our forefathers employed not only the knife, but the potential and even actual cauteries; and with a view to produce a firm union of its sides, which was

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considered as equally effectual, it was afterwards proposed by practitioners of more tender feelings, to employ the needle and ligature, or what was termed the Royal Stitch: and for the same purpose was invented the famous *punctum aureum*, which was performed in the following manner. After reducing the intestines into the abdomen, the sac was laid bare with a scalpel; and a piece of gold wire being passed round its upper end, the wire being likewise made to include the spermatic cord, it was then ordered to be twisted with a pair of forceps to such a degree of tightness as to prevent the descent of the gut, but not to interrupt the circulation in the spermatic cord *.

But none of these methods being found to answer, for even the actual cautery, when carried perhaps to the depth of the bone itself, did not secure the patient against

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* For a more particular account of these various modes of practice in the different kinds of hernia as employed in former times, see the writings of Albucañis, Paulus Egineta, Fab. ab Aquapendente, Hildanus, Parey, &c.

a return of the disorder, our modern pretenders have therefore ventured to improve upon the ignorance of ancient practitioners, and actually go the length of destroying not only the hernial sac, but even the testis also: without any knowledge of the anatomy of the parts, and having no characters to suffer from whatever consequences may ensue, they proceed without fear; and, by promising all that patients can hope for, they are sure to be every where well received. In consequence of this, in every large town, many operations are performed by them; numbers accordingly are for certain mutilated, and many thereby even lose their lives. Their method of proceeding is shortly this: They lay bare the hernial sac, and having reduced the prolapsed parts, a strong ligature is passed round both the sac and spermatic cord, and is drawn so tight as to destroy effectually, not only the passage along the sac, but the cord itself, and of course the testicle. On some occasions matters go no farther; but on others, such a degree of

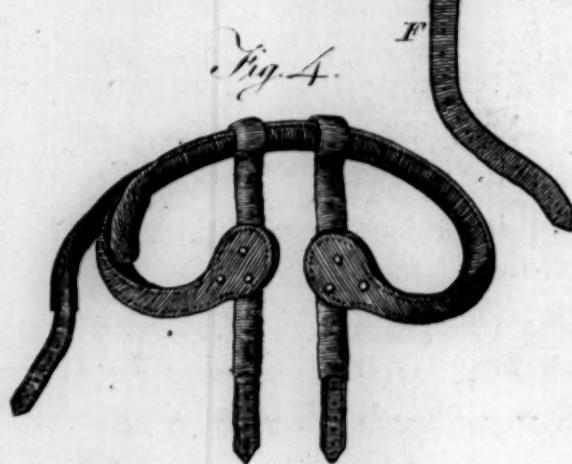
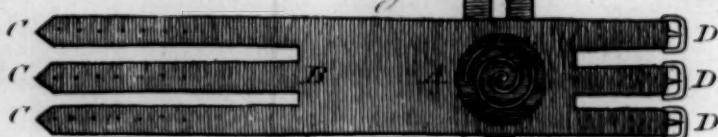
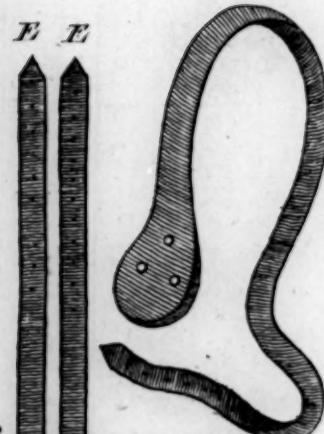
inflammation has been induced, as to terminate in the patient's destruction.

If any of these means, however, was to be productive of the effect proposed, viz. the prevention of every future descent of intestine, the risk incurred would be in some measure compensated by the advantage received: But the fact is much otherwise; for unless a truss be kept constantly applied, the patient continues liable to a return of the disorder in nearly the same degree as if no operation had been performed. Even the operation for the hernia itself, does not, as has been supposed, fortify the parts against a return of the disorder, the continued use of a truss being just as necessary after that operation as if it had not taken place.

I have dwelt longer on this circumstance than may be thought necessary by those who are much conversant in this part of practice; but as it is certain, that even of late years much mischief has been done by Itinerants in the various species of hernia, and as they still continue to impose upon the



Plate VIII.



A Bell Sculp^r.

the public, I thought it necessary to put the unwary on their guard against the effects of their knavery and ignorance.

In Plate VIII. are represented a variety of trusses for different species of hernia. Those here delineated are intended for the more usual kinds of hernia, viz. the inguinal, crural, and umbilical. When others are wanted for particular parts, some ingenious tradesman in that line of business should be applied to, with directions to fit the instrument with the nicest exactness to the parts for which it is intended. Indeed, the good effects of every bandage for this complaint, depend so much upon the exactness with which it is made to fit, that without the utmost nicety in this respect, it must always do more harm than good; for the sole purpose of a bandage in cases of hernia, is to prevent effectually the falling down of such parts as have been newly replaced: If therefore the pad or bolster of the bandage does not bear properly against the opening upon which it is placed, a portion of gut

may slip out, and be thus materially injured by the pressure of the pad. I have met with different instances of this kind, where bandages by not being exactly fitted did much mischief; and every practitioner must have observed them: it is therefore a matter of the first importance, that tradesmen be ordered to pay much attention to this circumstance. Every bandage used for this purpose ought to be of the steel-spring kind; for those composed of linen and other soft materials, can never be kept properly applied. Even in infancy the steel bandages, when properly made, are in general used with ease and safety: But at any rate, when they cannot be got to apply exactly, which in early childhood is sometimes the case, no dependence ought to be placed upon any other; for they always fret and gall the parts to which they are applied, and I never knew them in any one instance to answer the purpose.

Having premised these general observations, which relate equally to every variety of the disorder, and by which frequent repeti-

repetitions will be rendered unnecessary, we shall now proceed to the more particular consideration of the different species of hernia; and first of the Bubonocele.

SECTION II.

Of the Bubonocele.

TOGETHER with the general symptoms of strangulated hernia which we have lately enumerated, and to which we must here refer, the particular appearances of the bubonocele, or inguinal hernia, are, a soft somewhat elastic swelling, beginning in the groin, and descending by degrees into the scrotum in men, and into the labia pudendi, in women. When a portion of gut forms the tumor, it commonly feels tense, and this always in proportion to the degree of stricture that occurs in the opening of the tendon; and when any inflammation takes place, the least degree of handling or pressure always gives pain.

When the hernia contains omentum only, the swelling is both more soft, com-

U 4 pressible,

pressible, and more unequal, than when gut alone is down; the scrotum becomes more oblong, and of course less round, than in an intestinal hernia; and when the quantity of omentum is large, it is also much more weighty than a gut rupture of the same size: But in many cases, perhaps in the greatest proportion of all hernial swellings, the tumor is composed of both gut and omentum; and then the distinguishing symptoms of each can never be so clearly marked. In books, various symptoms are enumerated, for distinguishing the contents of every species of hernia; but whenever the case is any degree complicated, every candid practitioner must acknowledge, that no certainty as to this point can be obtained till the tumor is fairly laid open.

As there are some disorders with which the inguinal and scrotal hernia may be confounded, practitioners ought to be as much acquainted with their characteristic marks as possible. These complaints are, glandular or other swellings in the groin, whether

whether from the venereal disease or any other cause; that species of swelling termed *Hernia Humoralis*; and all the different kinds of hydrocele.

The venereal bubo and other swellings in the groin, are readily distinguished from hernia, not only by the absence of all the general symptoms of hernia, but by that incompressible hardness with which all such swellings are at first attended, and by the fluctuation of matter which in their suppurated state is always observable.

In the *hernia humoralis*, or swelling of the testicle, the hardened and enlarged state of the testicle itself, as well as of the epididymis; their being exquisitely painful to the touch; the tumor being remarkably heavy in proportion to its bulk; and the spermatic process being commonly very free from swelling; are in general pretty certain marks of distinction. In the *hernia humoralis*, too, the intestines are free and unobstructed, and the other general symptoms of hernia as formerly pointed out are wanting.

In the hydrocele of the tunica vaginalis
testis,

testis, the tumor in general is more equal to the feel than in hernia: in the former, the swelling always begins in the under part of the scrotum, and proceeds upwards: whereas the very reverse occurs in herniæ. Except in cases of very enlarged hydrocele, the spermatic process is always perfectly free and distinct; whereas in every case of hernia where the tumor descends to the scrotum, the spermatic cord cannot in any part of its course be distinguished. In a hydrocele, a fluctuation of a fluid is distinguishable; in a hernia it is otherwise.

From the anasarcaous swelling of the scrotum, or hydrocele of the dartos as it is termed, hernia is very readily distinguished; and indeed the means of distinction are so obvious, that they need not be here enumerated; but there is another species of hydrocele, viz. the hydrocele of the spermatic cord, which on some occasions it is no easy matter to distinguish from hernia, and which therefore requires particular attention.

The species of hydrocele, where the water

water is collected in one or more cells of the spermatic process, now and then begins in the under part of the cord, and proceeds upwards; and in such cases, this circumstance alone is a sufficient means of distinction between it and hernia, in which the swelling always proceeds from above downwards; but it sometimes happens, that the swelling in this kind of hydrocele begins even within the opening in the abdominal muscle, and by degrees falls downwards. In such instances, it is altogether impossible from the state of the tumor merely, to say whether it is the one disease or the other. The general symptoms of hernia, such as pain and tension of the abdomen, obstructed intestines, &c. must be particularly attended to: and as these do not occur in any species of hydrocele, when they happen to take place they will commonly throw much light on the real nature of the disease. In some cases, however, these and every other means of distinction are wanting; but even in such circumstances a prudent
practi-

practitioner will never run any risk, either of hurting his patient, or of affecting his own reputation; which the mistaking a Hernia for a Hydrocele, and treating it as such, must always do; and which, to the disgrace of Surgery, has on some occasions actually happened.

In all such cases, where any degree of doubt occurs, as well as in every case of tumor in the testicle where the most perfect certainty is not obtained, and when it is necessary to have recourse to an operation, the surgeon ought to proceed as if the disorder was a real hernia: By doing so, every risk will be avoided; and on the tumor being laid cautiously open, the true nature of the disease will be then rendered evident, and the practitioner accordingly will be at liberty to apply the means best suited for its removal. Whereas by adopting a contrary method, and by treating as a Hydrocele what afterward turns out to be a true Hernia; independent of any injury to his own reputation, he runs a very great risk of destroying his patient.

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In the treatment of the Bubonocele, when the various means we have recommended when treating of hernia in general are employed without success, the surgeon is then under the necessity of proceeding to the operation; and the method of doing it is this.

A table of a convenient height being placed in a proper light, the patient must be laid upon it with his head and body almost horizontal, whilst at the same time his buttocks are somewhat elevated by pillows laid beneath them. The legs hanging over the edge of the table ought to be separated so as to admit the operator between them; and should in that situation be firmly secured by an assistant on each side, who should take care to keep the thighs so far raised, as to relax all the abdominal muscles.

In order to afford as much empty space as possible for the return of the protruded parts, the patient should be advised to empty his bladder entirely; and the parts having been previously shaved, an incision

must

must now be made with a common round-edged scalpel through the skin and part of the cellular substance, beginning at least an inch above the superior end of the tumor, and continuing it down to the most depending part of the scrotum. Even although the tumor does not extend to the bottom of the scrotum, the parts should be laid open in this manner. By a free external incision we are enabled to finish the operation with more ease and freedom than when the first opening is not so large; it does not produce much more pain than a small incision; and by being continued to the bottom of the scrotum, the matter produced in the upper part of the sore is prevented from collecting below, which it is otherwise ready to do.

The operator now goes on to divide slowly the rest of the cellular substance, together with some tendinous kind of bands, which, unless the disorder is very recent, are universally met with, either loose upon the surface of the hernial sac,

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or, on some occasions, passing as it were into its substance. Even this external incision of the teguments ought to be made with great caution : For although, in by much the greatest proportion of hernial swellings, the spermatic vessels lie behind the protruded parts, yet on some occasions they have been found on the anterior part of the tumor ; so that in order to avoid the risk of wounding them, as soon as the skin is divided the remainder of the operation ought to be done in the most cautious manner, care being taken to avoid every large blood-vessel that makes its appearance.

This circumstance of the prolapsed parts getting down behind the spermatic vessels, has never, so far as I know, been taken notice of in books ; it must therefore be a very rare occurrence. As I met with it, however, in one case, where the fact was exceedingly evident, the possibility of its happening I have therefore no reason to doubt. If we attend only to the usual conformation of these parts, the hernial sac,

we

we would say, ought never to get behind the spermatic cord. But we know well, that in no part of the human body is nature more apt to desert her ordinary course, than in some circumstances relating to the testicles and their blood-vessels. We have already observed, that till near the period of delivery, the testicles continue in the abdomen; and about that time, fall down in a gradual manner to the scrotum. Many instances, however, occur, of both testes remaining in the abdomen through life: Sometimes one remains, and the other falls into the scrotum. On other occasions, one or both fall into the groin, and never proceed farther; a circumstance which every young practitioner should be aware of, as instances have occurred of a testicle remaining in the groin being mistaken for a hernia, and of much pain and distress being produced by different attempts made for their reduction. Now, if such varieties as these occur in the mechanism of these parts, why may not nature in some instances produce such a conformation

formation as may, in the event of a hernial sac falling into the scrotum, bring the spermatic cord, and even the testicle itself, into a situation anterior to the protruded parts? I shall not here enter into the discussion of the manner in which such a circumstance may be produced; but, as I am certain that the fact has happened, and as it may therefore occur again, I consider it as an additional argument for the propriety of dividing the hernial sac in the cautious manner here directed *.

In making this first incision of the skin, it is usual to do it by pinching up the teguments, and then dividing them with a scalpel; but no surgeon of steadiness and dexterity will ever think it necessary to proceed in this manner: for this incision of the skin is done with much more neat-

* Since this went to the press, I find that a similar instance is recorded by Le Dran, in his *Treatise on Ruptures*, of the spermatic vessels having been found on the anterior part of a bubonocele.—Such a situation, therefore, of these vessels, is perhaps more frequent than is commonly imagined.

ness, and with equal safety, by the operator grasping the tumor with his left-hand, in such a manner as to render the teguments on the anterior part of it as tense as possible, while with the scalpel in his right hand he divides the skin from one end of the swelling to the other.

The division of the skin and cellular substance being continued in the manner directed till the fac is laid bare, an opening must be made in it so as to bring its contents into view; and the most safe place for such an opening is, not about the middle of the tumor, as is commonly directed, but as near to the under point of it as possible: It is here done with as much ease as in any other part; and besides, the gut is seldom if ever found just at the bottom of the fac, which is commonly occupied with a quantity of bloody serum; so that the risk of wounding it there is much less than in any other part of the swelling. In making this perforation into the fac consists the greatest nicety in the operation, the utmost caution being necessary to avoid wound-

wounding the parts protruded from the abdomen. Good eyes and a steady hand are in no operation more requisite than in this: With these, any practitioner acquainted with the anatomy of the parts may be sure of doing the operation properly, and without them the best anatomist must undoubtedly go wrong.

With the same scalpel that divided the skin and cellular substance, the operator must proceed slowly, dividing one fibre of the sac after another, till there is reason to think that the whole substance of it is cut through. This may be always discovered by means of the blunt end of a probe: If it passes in easily, we may conclude with certainty that the sac is divided; and if it does not, the incision must be continued in the same gradual manner somewhat farther, when the same trial with the probe must be again made.

In prosecuting this division of the sac, a good deal of assistance is obtained from the use of a small sharp-pointed directory, open at the extremity, as is represented in

Plate IX. fig. 3. By pushing the end of this instrument below some of the fibres of the sac, they are thereby separated from the parts underneath, and may be thus divided with more safety than in any other manner; and in the same way the remaining parts of the sac must be divided, till this part of the operation is finished*.

In almost every case of hernia where the tumor is confined to the groin, and even where the swelling extends to the scrotum, if the parts are recently protruded, the hernial sac is found very thin, and in such cases is always soon cut through; but it is necessary for the information of young practitioners, to observe, that in hernial swellings of long standing, the sac frequently becomes so very thick, as to require much more dissection than beginners

* In the 4th Volume of Memoirs of the Paris Academy of Surgery, there is a very ingenious paper on *Herniae* by Monsieur Louis. But although there are many useful observations communicated in this treatise, Mr Louis in one point I think has gone far wrong, in ridiculing that degree of caution shown by some

ginners commonly expect: By going on, however, in the cautious manner we have directed, every risk of wounding any material part may be avoided.

As soon as an opening is made quite through the sac, a circumstance of which we are made certain, as was already remarked, by a probe passing easily in, it ought then to be farther enlarged, till it is

X 3 of

surgeons in dividing the hernial sac : The division of the sac, he says, is attended with so little difficulty, that he does not consider it as different in that respect from the first external incision of the skin. His words are : " Jamais le sac ne m'a donné ni plus de peine, ni plus d'embarras que la peau ; on divise, pour ainsi dire, celle-ci du *premier trait*, et le sac du *second*." In the hands of such an expert operator as Mr Louis, the scalpel even in this manner may be so managed as to do no harm, but with the general run of practitioners much mischief would be produced by proceeding in this part of the operation so rapidly as is here directed. And when we reflect that the difference of a few seconds in the course of the operation, is all that could be gained by the greatest dispatch we can employ, little doubt, I think, can remain as to the propriety of proceeding through every part of it in the most deliberate manner.

of such a size as to admit the fore finger of the operator's left hand.

The finger being now introduced, is to be used as a director for entering the narrow blunt-pointed bistoury, represented in Plate VII. with which the surgeon is to divide the hernial sac along its whole length from below up to the opening in the external oblique muscle. By means of the finger as a director for the bistoury, this part of the operation is performed with perfect safety; and the bistoury here delineated, renders the many complex instruments formerly employed not only for this part of the operation, but for the subsequent division of the tendon, quite unnecessary.

On laying the sac open at the bottom, a quantity of coloured fluid always rushes out, and the protruded parts now come fully into view: If a portion of gut is down, and is not much entangled with omentum, by being now set at liberty it pushes out immediately on the sac being opened; thereby giving the appearance of having been

been collected in a larger quantity than the size of the tumor gave reason to expect.

The portion of gut found in hernial swellings is very various, no part of the intestinal canal being entirely exempted from falling down. Hitherto the ileum has been commonly supposed to form the substance of the greatest proportion of such tumors; later and more accurate observation, however, renders it probable, that the cæcum, appendix vermicularis, and part of the colon, are perhaps as frequently contained in herniary sacs as any other portion of the gut.

The sac being laid fully open, the parts contained in it ought now to be examined with the nicest attention, in order to discover whether they are all sound or not; and if upon an attentive inspection they are found to be sound, that is, if they are not evidently in a gangrenous state, even although they do seem to be considerably inflamed, every endeavour should be used to get them immediately returned into the abdomen.

In making the reduction, whether intestine or omentum, or a portion of each, have been found contained in the swelling, those parts of them which appear to have come last out, ought to be first pushed back; the difficulty and trouble of returning them being thereby much lessened: And in making the reduction, it both answers the purpose better, and is less likely to do mischief, to apply the fingers to that part of the intestine connected with the mesentery than to the convex part of the gut. While the reduction is going on, the patient's thighs and loins should be still more elevated than they were during the preceding steps of the operation; as this posture of these parts tends much to facilitate the return of the protruded intestines to the abdomen.

When the disease is recent, and the parts have not been frequently down, it sometimes happens, that by pulling out a little more of the gut than was formerly in the sac, any obstruction which occurred to its being

being replaced is thereby removed ; and if the protruded parts are not of great bulk, they may thus be sometimes reduced, without any necessity for enlarging the opening through which they have passed from the abdomen : But when upon trial this cannot be done with great ease, it should never be attempted ; much more danger being to be dreaded from any degree of force used for the reduction of the gut, than can ever occur from finishing the operation by an enlargement of the opening in the tendon of the external oblique muscle.

As the tendon of this muscle runs in an oblique direction from above downwards, and as the opening through which the contents of a hernia protrude, is formed merely by a separation of the tendinous fibres from one another, the direction of this opening is of course the same with that of the tendon ; that is, it runs somewhat obliquely from the spine of the ileum to the os pubis.

In enlarging this passage, then, for the reduction of such parts as have passed through

through it, as a transverse section of the tendon is by no means necessary, the knife should be carried obliquely upwards, so as merely to continue the natural separation of the tendinous fibres.

The finger was recommended as the best director for the knife in opening the sac, and in dividing the tendon it is equally necessary. By insinuating the finger into the aperture in the tendon immediately above the protruded parts, the point of the blunt bistoury is easily introduced upon it; and in this manner, by keeping the end of the finger always a little before the bistoury, the opening may be enlarged to any necessary extent without any risk of wounding the contiguous parts.

In general, a very small enlargement of the natural opening in the tendon is found sufficient for the reduction of the gut and other parts: But the size of the opening ought by all means to be fully sufficient for the end proposed; for it is better to exceed in making it somewhat too large, than to run any risk of hurting the parts
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by forcing them through a very small aperture.

If upon introducing the finger any adhesions of the gut to the contiguous parts are discovered, the incision in the tendon ought to be larger than might otherwise be necessary, in order that the finger may be freely admitted so as to destroy such adhesions as it can reach; for unless they are removed, complete success from the operation cannot be expected.

Independently of such adhesions internally, it frequently happens, by long confinement in the scrotum, pressure, and perhaps other causes, that strong adhesions are formed among the parts contained in the sac itself; and before they can be with propriety reduced, it is always necessary to attempt to separate them.

When adhesions of this kind occur, as they sometimes do, between different parts of the protruded gut, the greatest caution is necessary in separating them: But connections of this nature between one portion of the intestinal canal and another, are seldom
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very firm, and are commonly easily separated by the fingers alone ; and when the connection is formed by means of long filaments, which is sometimes the case, the easiest method of removing them is to cut them, either with a pair of scissars or the bistoury : But when it is found, that one part of a gut adheres so firmly to another as not to be separated but with difficulty, it is much better to return the whole even in that state into the abdomen, than to run the risk of hurting the intestine materially by using much force.

When, again, adhesions occur between the gut and the hernial sac, or between the gut and omentum, if the filaments producing the connection cannot be otherwise removed, as there is no great hazard in wounding the omentum, and still less in hurting the sac, a very small portion of these may be dissected off, and returned with the gut into the abdomen ; and in the same manner, when the omentum adheres so firmly to the sac as not to be separated in any other manner, no danger can ever accrue from



from the sac being somewhat encroached upon.

The risk and trouble attending the practice now recommended is nothing, at least it is very trifling, when compared to the inconveniences that would ensue from leaving either the omentum or gut adhering externally to the hernial sac, as is advised by some writers when such adhesions cannot be very easily divided. The smallest portion of gut being left down, would run a great risk of suffering by exposure to an unusual degree of cold, and to the effects of the external air at the different dressings; and by leaving part of the omentum to protrude through the opening from the abdomen, one great advantage to be expected from the operation would be lost, viz. the prevention in future of that risk which a patient with a portion of protruded omentum is always liable to, of a piece of gut slipping down, and perhaps of becoming strangulated.

After returning the contents of the sac into the cavity of the abdomen, it has been proposed

proposed by some authors, to pass a ligature round the upper part of the sac just at its neck, with a view, as we are told, of procuring a reunion of its sides, in order that it may serve as a means of preventing future descents of the bowels.

But as such a ligature cannot be applied without much risk of injuring, or even of destroying the spermatic vessels, with which the posterior lamella of the sac is immediately connected, the practice from that consideration alone ought to be laid aside; but in reality it does not appear to be in any degree necessary, as this very union of the sides of the sac is universally produced merely by that degree of inflammation which always succeeds to the division of it by this operation.

Hitherto we have recommended the immediate reduction of the contents of hernial tumors upon the supposition that they have been only displaced; that they have been adhering to one another or to the neighbouring parts; or perhaps that they have
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been more or less in a state of inflammation. But when it appears that this inflammation has already terminated in gangrene, as the return of such mortified parts, whether of omentum or intestine, might be exceedingly hazardous, a greater degree of caution becomes necessary.

When the omentum is found in a mortified state, as the excision of a portion of this membrane is not attended with much risk, it has been the common practice to cut away the diseased parts; and in order to obviate any inconvenience from the hemorrhagy which might ensue, we are advised to make a ligature on the sound parts previous to the removal of those that are mortified; whilst the ends of the ligature being left hanging out of the wound, the surgeon has it in his power to remove them when circumstances appear to render it proper.

These ligatures on the omentum, however, having frequently been productive of bad consequences, such as nausea, vomiting, cough, fever, pains in the belly,
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and inability to sit erect; and it having been found by the experience of many individuals, that no hemorrhagy of any importance ever occurs from a division of this membrane even in a sound unmortified state; such parts as have become gangrenous may therefore be freely cut off, and the remaining sound parts be afterwards without the intervention of ligatures introduced into the abdomen with no risk whatever. This is now the opinion of different practitioners*: But if it should ever happen, on cutting off part of the omentum, that a vessel of any size is divided, a ligature may with great safety be passed about the vessel itself, without including any of the membrane; and the ends of it being left long enough to hang out at the wound,

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* A very accurate paper upon this subject may be seen in the 3d Vol. of *Memoires de l'Academie Royale de Chirurgie* of Paris, by Monsieur Pipelet, in which several cases are related of the bad effects produced by ligatures on the omentum.

Mr Pott is also of this opinion.—*Vide Treatise on Ruptures.*

the threads may be afterwards pulled away at pleasure.

Another circumstance sometimes occurs, too, which renders the removal of part of the omentum necessary: when a rupture has been of long duration, and a considerable portion of caul has remained long down, from the pressure made by the usual suspensory bandage and other circumstances, it frequently happens that considerable quantities of the protruded parts become much thickened, very hard, and collected into lumps. When these lumps are not very large, there is no necessity for removing them, as when small they may be returned into the abdomen without producing any inconvenience; but whenever it appears to the operator, that by their bulk and hardness they might probably do mischief if reduced into the belly, they ought as certainly to be cut off as if in a state of real mortification.

When it is determined to remove any part of the omentum, the easiest and safest method of doing it is this. The mem-

brane ought to be carefully expanded at the part intended to be cut; and in this state it is very easily divided by a pair of thin-edged scissars, much more so indeed than by any other instrument. When fully spread out, any turn of the intestine that happens to be enveloped in it, is at once brought into view, which without this precaution we would run a great risk of dividing by the scissars.

When, again, a portion of gut is found to be mortified, if it should be returned in that state, a discharge of feces would certainly take place into the cavity of the abdomen, as soon as the mortified spot should separate from the sound. In order to prevent such an occurrence, which would soon terminate in the patient's death, if it is a small spot only that is diseased, we ought to endeavour by means of a needle and ligature, to connect the sound part of the gut immediately above the mortified spot, to the wound in the abdominal parietes. By this means, when the mortified part separates, or on its being immediately cut

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out, which is perhaps better, the feces are discharged by the wound; and different instances have occurred, where the loss of substance produced by the mortification was not extensive, of the opening into the gut becoming gradually less, and at last healing entirely: But whether the event should prove so fortunate or not, whenever a portion of gut is observed to be completely mortified, it ought by all means to be secured by a ligature to the parts most contiguous to the wound.

And farther, when the mortified portion of gut is of great extent, and includes, so far as it goes, the whole circumference of the intestine, the gangrenous parts of it ought to be cut out at once; and if the quantity thus taken away is not so considerable as to prevent the ends of the gut from being brought into contact with one another, it ought to be immediately effected in the manner we shall direct in another chapter when treating of Gastroraphy. This at least affords a chance of the ends of the gut being brought to reunite; and if un-

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fortunately that event should not take place, as the gut ought here also to be connected to the parts contiguous to the wound in the abdomen, a passage for the feces will still be secured by the groin.

Although in cases of hernia, attended with a mortification of the intestines, many have recovered by the method we have recommended who otherwise must have died; yet it will be readily supposed, that the risk attending patients in such a state must be very great: But although a small proportion only of such as are unfortunately in this situation should recover, yet still no practitioner would be excusable for omitting those means which afford the greatest probable chance of a recovery. A patient of my own is now living, and in good health, voiding his feces by the anus, who lost at least one foot of the intestinal canal by mortification in a case of crural hernia; and we are told by different authors, of similar recoveries equally remarkable.

It is to the moderns chiefly, we must remark, that this very material improvement

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in the treatment of hernia is to be attributed. It is even recorded of Rau, who lived in a very late period, that on opening a hernial sac, where a gangrenous state of the parts was detected, as the case was considered as desperate, he laid down his knife and proceeded no farther in the operation. This patient, who died next day, would in modern practice have had at least some chance for life.

When it is therefore discovered, that part of the contents of the sac are mortified, all such portions as are to be removed ought to be cut off; and the remaining sound intestine being retained till properly secured by a ligature, the opening in the external oblique muscle may then be dilated with safety: Whereas, if it should be enlarged before the diseased part of the gut is taken away, the gangrenous portion might very probably slip up together with the sound; but by the precaution now recommended every risk of this nature is prevented.

The parts forming a hernia being all completely replaced, when the sac in which

they were contained is found thick, hard, and much enlarged, as in such a state no good suppuration can take place, and as its preservation cannot be in any degree useful, such parts of it as can be cut away with propriety ought to be removed: All the lateral and fore-parts of the sac may be cut off with safety; but as it is commonly firmly connected with the spermatic vessels behind, this part of it ought not to be touched.

The operation being now finished, by the protruded parts being replaced, and those intended to be removed being cut off in the manner directed, the remaining sore must be dressed as lightly as possible with charpee of the softest kind; and the best bandage for retaining the dressings, is the usual suspensory bag properly stuffed with soft lint.

The patient on being carried to bed should be so placed as to have his loins somewhat elevated above the rest of his body, and should in that situation be immediately laid to rest: Opiates are here particularly useful: To prevent, or at least to moderate, the fever which commonly succeeds,

ceeds, the patient should be kept cool; in plethoric habits, blood-letting should be prescribed, together with a rigid low diet; and lastly, a frequent use of gentle laxatives, so as to keep the belly moderately open, is particularly proper.

When however the constitution has been previously much reduced, either by long sickness or any other cause, instead of blood-letting and a low diet, a nourishing regimen should be prescribed; for if a patient in such circumstances be not properly supported, he will not so readily recover from the effects of the disorder: And it is proper to remark, that in ordinary practice, the indiscriminate use of blood-letting, and an abstemious regimen, in every case of hernia, appears to be too rigidly adhered to; for although this practice proves always more effectual than any other means in every case of rupture attended with inflammation, yet daily experience convinces us of its being highly pernicious where the system has been already much reduced by evacuations, and where no inflammatory symptoms take place.

The sore being regularly dressed as often as it appears necessary in the same easy manner as at first, and the same degree of caution being continued both with respect to diet and other circumstances, if the patient survives the first three or four days he will in general recover: And as soon as the sore is firmly cicatrised, a truss ought to be properly fitted to the parts, and should never in any future period of life be laid aside.

By many it has been recommended, and it is still a very common practice, to stitch up the wound with two or three sutures; but as no real advantage can be obtained from this, and as it has been on some occasions productive of mischief, it ought not to be attempted. No person will probably say, that such ligatures ought to be carried so deep as the tendon of the oblique muscle; and if they are only made to pass through the external teguments, they can have no effect in preventing a protrusion of intestines: On the contrary, it does now and then happen, during the cure of the wound after this operation, that small portions of

gut

gut pass out at the opening in the tendon, which are always readily seen and easily reduced when the external parts have not been drawn together; but on the skin being by ligatures made to cover the greatest part of the wound, I have known it more than once happen, that portions of intestines have passed out at the opening in the tendon, and remain protruded for a considerable time without being noticed; so that the practice ought not to be encouraged.

After laying the sac bare, it was some time ago recommended by Mr Petit and other French practitioners, to endeavour to reduce the protruded intestine without dividing the sac. One great advantage expected from this, was, the prevention of those bad consequences which are supposed will most likely ensue from the external air finding access to the contents of the abdomen.

It ought to be remembered, however, that unless the hernial sac is laid open, we cannot possibly know in what state the protruded bowels are; so that parts might be returned

returned into the abdomen in such a state of disease as would add greatly to the patient's risk. Not only the intestines are liable to mortification, but collections are apt to occur in the hernial sac, of a very fetid putrid serum, which, on being pushed into the abdomen, might be productive of much mischief. And besides, it has sometimes happened, that, on laying open a hernial sac, the cause of strangulation has been detected, either in the entrance to the sac itself, or among the parts protruded along with it: For although, in a great proportion of all the instances of hernia that occur, a stricture of the passage in the external oblique muscle is to be considered as the cause of all the bad symptoms, yet now and then instances of the contrary are observed; one of which I met with some years ago, and I have heard of others of the same kind.—In a case of scrotal hernia of long standing, symptoms of strangulation at last supervened; and on laying open the sac, the appendix vermiformis was found so tightly twisted round a portion

tion of gut, as left no reason to doubt of that circumstance alone having been the cause of all the mischief. If the parts had here been returned into the abdomen without dividing the sac, no advantage whatever would have occurred from the operation ; and, after death, the practitioner would have had the mortification to find, that, in all probability, the patient's life might have been saved, if this very necessary measure had not been omitted.

Instances of the protruded parts being returned into the abdomen without opening the sac, are enumerated by different French authors ; and in some of these which ended fatally, it was found on dissection, that strangulation of the gut had been occasioned by stricture formed by the parts contained within the sac, and not by the tendon of the external oblique muscles.

Disasters of a nature similar to these we have mentioned, having on different occasions occurred to Mr Petit and others who had adopted the practice of returning the parts

parts contained in the sac without dividing the sac itself, it has now accordingly been very generally laid aside. Even Mr Petit himself was at last so convinced of the inconveniences resulting from it, that he is said to have joined keenly with those who had opposed it from the time of its being first introduced.

By some authors again, it is advised, to reduce not only the protruded bowels, but even the hernial sac itself, without opening it; whilst, by others, it is alleged, that the sac can never be reduced. Mr Louis, in the paper we have already quoted, is clearly of this last opinion, as Mr Pott also is. But we have the testimony of different authors of credit, and particularly of Mr Le Dran, to the contrary; and I have myself met with one instance of this, where the appearances were so unequivocal as to leave no doubt with me respecting it.

In cases of hernia where the parts have been long and repeatedly down, such firm adhesions are usually formed between the sac and the contiguous parts, as to reduce them

them apparently into one inseparable mass; so that, in such circumstances, reduction of the sac becomes altogether impracticable. But although this is perhaps in every instance found to be the case in ruptures of long continuance, we are by no means warranted in supposing that it is so in every case of recent hernia. We know that the adhesion of one part of the body to another, cannot anywhere be instantaneously produced. Even where recent division has taken place, and when the divided parts are kept in close contact, the space of several days is commonly required to effect a firm reunion. Now in the case of a portion of membrane being forced into a natural opening, where the parts are neither rendered raw by art, nor are as yet affected with inflammation, a still longer period we may suppose will be necessary for this effect; and in fact, altho' I suppose there is scarce an instance of a hernial sac of long duration being reduced, yet there are sundry indisputable facts which show, that in recent ruptures the sac may be returned. The
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one above alluded to, which occurred in an operation at which I was present several years ago, had been down five or six days, and formed a tumor in the groin of the size of an egg : The sac did not in any point seem to adhere ; the operator therefore found no difficulty in reducing it ; and on dissection after death, which happened in about two days from the operation, the passage through the external oblique muscle was found dilated, but no existence of a sac could be traced into it. It is not, however, my own opinion, that this is a matter of much importance in practice, I mean the practicability of reducing the hernial sac or not ; for the various reasons we have already given, against the propriety of returning the contents of a sac without opening it, occur with equal force against the proposed practice of returning the sac itself unopened. But as there is a possibility of future experience deriving some advantage from this circumstance, it is certainly right to have the fact as clearly established as possible.

Hitherto we have been supposing the
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disorder to exist in a male subject only; but as the same openings in the external oblique muscle are met with in females, so they are also liable to the species of rupture we have just been describing.

In males, however, the bubonocele is observed to occur more frequently than in women; and as in them too the cellular membrane surrounding the spermatic vessels is very lax and dilatable, so hernial swellings of this kind are commonly much larger in men than in women. But instances do now and then occur of such tumors even in women becoming very large: in such cases, the protruded parts fall down to the very bottom almost of the labia pudendi.

As the openings in the external oblique muscles of females are exceedingly similar to those in male-subjects, so the treatment of this species of hernia is in them very similar to what is found to answer in men. In cases of strangulated gut, when glysters, blood-letting, and the other remedies formerly enumerated, happen to fail, the same operation of laying open the hernial sac,
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and of enlarging the opening in the tendon of the oblique muscle, is here equally proper as in the other sex.

With modest women, disorders of this kind often take place without the practitioner in attendance being made acquainted with them; whenever therefore such symptoms of colic occur as give reason to suspect the existence of hernia, a particular examination ought always to be made, in order if possible to detect the cause of the mischief, from the removal of which a cure can alone be expected.

S E C T I O N III.

Of the Hernial Congenita.

BY attending to the anatomical description given in the first section, of the parts chiefly concerned in cases of hernia, it must evidently appear, that in the ordinary species of scrotal hernia, the parts protruded from the abdomen must of necessity be contained in a bag or sac perfectly distinct from the testicle; which in that kind

kind of rupture is always found in its usual situation in the scrotum, surrounded by its own proper membrane the tunica vaginalis, and not in contact with any other part whatever.

We then made it appear too, that if in early infancy a portion of gut should slip down by the same passage with the testicle, that the parts so protruded must be in immediate contact with the testis, and must thus be surrounded with the tunica vaginalis; so that in this species of rupture, very properly by Haller termed *Hernia Congenita*, the tunica vaginalis testis forms the hernial sac.

The discovery of this species of hernia, which was reserved for modern times, enables us to account for a number of cases recorded in books of surgery, of the contents of ruptures having been found in the same bag with the testicle: A circumstance which, till this discovery, was always considered as a clear proof of the peritonæum being frequently ruptured in those disorders; as there was not otherwise a possi-

bility of accounting for the phenomenon. But we now know, that the peritonæum in these cases of hernia is never ruptured; and that the parts forming a hernial tumor being found in contact with the testicle, is a circumstance easily explained from our more accurate anatomical knowledge of those parts.

In the treatment of ruptures of the congenital kind, little difference occurs from the management of the bubonocele in its more ordinary form. When the parts can be replaced without any operation, it ought always to be done, a truss being at the same time recommended as a preventative of future descents; and when symptoms of strangulation take place, which cannot be otherwise removed than by the operation, it here becomes equally necessary as in any other species of rupture.

When from the circumstance of the parts having been protruded in early infancy, and from their having at times continued to fall into the scrotum from that period downwards, there is reason to suspect

pect that the hernia to be operated upon is of the congenital kind, the surgeon in such a case, in laying open the contents of the tumor, must proceed with still more caution than in cases of ordinary rupture; for the tunica vaginalis which here forms the sac, is commonly much thinner than the usual sac of herniæ. On the parts being returned, more attention is necessary too in dressing the wound than in other cases of hernia; for the testicle being here laid bare by its vaginal coat being cut open, if it is not treated with much delicacy it will very probably inflame, and may thereby be productive of much distress. The testis therefore ought to be immediately enveloped with its own proper covering, the loose tunica vaginalis; and at every dressing, care should be taken to prevent as effectually as possible every access to the external air.

In other respects the management of the hernia congenita is perfectly similar to that of any other rupture.

SECTION IV.

Of the Crural or Femoral Hernia.

THE seat of this species of hernia, as we have elsewhere remarked, is on the upper and anterior part of the thigh; the protruded parts passing out at the same opening through which the large blood-vessels of the thigh are transmitted from the abdomen.

In the description given in a former section, of the external oblique muscles of the abdomen, the under edge of these muscles, it was remarked, by doubling backwards, forms a kind of ligament, which extends in an oblique direction from the spine of the ileum near to the symphisis pubis. It is this under-border of these muscles which is commonly known by the name of Poupart's or Fallopius's ligament.

Excepting at its two extremities where this ligament is attached to the pubes and ileum, it is not in any other part connected with bone. By the particular shape of the ileum at this part, a kind of arch is formed

formed by the ligament passing over a hollow in that bone through which the large artery and veins of the thigh find a passage, the rest of the cavity being filled up with cellular substance, glands, and fat; and all these parts again are covered and tied down by a firm tendinous aponeurosis of the fascia lata of the thigh.

It is under the tendon or ligament just now described, that the parts composing a crural hernia descend. On some occasions they pass immediately over the femoral artery and vein; on others, they are found on the outside of these vessels; but more frequently they lie on the inside, between them and the os pubis.

As the protrusion of any of the abdominal contents produces in this situation nearly the same set of symptoms as occur in cases of inguinal hernia, the method of treatment recommended in that species of the disease is also applicable here.

When, therefore, in the femoral hernia, symptoms of strangulation occur, we must put all the remedies in practice already

advised for the inguinal rupture: Only here, in attempting to reduce the parts by the hand, the pressure should be made directly upwards, instead of obliquely outwards, as we directed in the other; and when these means are unfortunately found to fail, the operation itself must then be employed.

A free external incision was inculcated in cases of inguinal hernia; and it is here equally necessary, or even more so, from the parts concerned being more deeply seated than in the other. By too much timidity in making the external incision, the operator is frequently much incommoded in all the subsequent steps of the operation. The external cut should extend at least from an inch above the upper end of the tumor to the same space below the most depending part of it.

The membrana adiposa, tendinous expansion of the fascia lata, and hernial sac, being all cautiously divided, if the protruded parts are found in a situation proper for reduction, we should immediately attempt

attempt to replace them ; and as the space below the ligament through which they have passed is considerable, this may frequently be done without dividing the ligament, merely by pressure properly applied with the hand, while the patient's body is placed in the posture we have already directed in the bubonocele, as being best suited for favouring a return of the bowels.

When in this manner the contents of the tumor can be reduced without the necessity of dividing the ligament, the patient is thereby saved from a great deal of hazard, as from the particular situation of the spermatic vessels and epigastric artery with respect to this ligament, any cut made into the substance of the latter, runs a very great risk of dividing one or other of them.

The spermatic vessels as they go along to pass out at the opening in the external oblique muscle, run nearly upon the very edge or border of Poupart's ligament almost through its whole length, so that I consider it as impossible to make a free

division of the ligament without cutting them across.

We have been advised indeed by some, in order to avoid wounding the spermatic vessels, which they acknowledge would certainly happen if the incision should be carried directly upwards, to cut in an oblique direction outwards. In this method, they allow, that the epigastric artery, from the course it usually takes, may very probably be divided: But the risk attending the division of that artery they do not consider as of much importance; and if the discharge of blood occasioned by any wound that may be made in it should happen to be considerable, they speak of it as a very easy matter to take it up by a needle and ligature, and needles of various shapes have been invented for this purpose. Even in emaciated people, however, it is a matter of much difficulty to reach the epigastric artery, and in corpulent patients it will be found altogether impossible to surround it with a ligature; so that the younger part of the proctilium ought to be very cautious in

in receiving the directions usually given on this subject. On reading the remarks of the late Mr Sharpe upon this point *, to secure the epigastric artery by means of a ligature, one would expect to be the easiest of all operations; but the difficulty which in reality attends it, is such as must convince every one who has tried it, that Mr Sharpe himself had never put it in practice.

But even although this accident of wounding the epigastric artery could be guarded against in the most easy and effectual manner, yet I will venture to say, when a femoral hernia is of any considerable size, the distension of the ligament thereby produced must bring the spermatic vessels so nearly on a line with the under border of the ligament, as to render it altogether impossible to divide the one without the other; and whoever will examine these parts in the state we have now described, will see that this cannot be avoided, whether the incision be carried directly upwards,

* Critical Inquiry into the present state of Surgery.

upwards, or even obliquely outwards or inwards.

Some authors, from being sensible of the danger attending this part of the operation, have proposed merely to dilate the passage, instead of dividing the ligament; and Mr Arnaud, a French writer on this subject, delineates a curved levator for the purpose of supporting the ligament till the protruded parts are reduced: but as we are to suppose in every case of strangulated hernia, that the passage through which the parts have fallen down is already dilated to nearly its utmost possible extent, in such a situation to attempt a farther dilatation without the assistance of the knife, would seldom, it is probable, be productive of any advantage.

A considerable time ago it occurred to me, that in this part of the operation some assistance might be derived from performing it in the following manner; and having since had occasion to make trial of it in one case where it answered most effectually, I can now therefore recommend it with

with some certainty. Instead of dividing the ligament in the ordinary way, I only made an incision into part of its thickness: In order to protect the parts below, I first insinuated the fore-finger of my left-hand between the gut and the ligament; and then with a common scalpel made a cut of about an inch in length, beginning above and proceeding to the under border of the ligament.

The first scratch with the scalpel was very slight; but by repeated touches, it was made to penetrate almost through the whole thickness of the ligament, till at last a very thin lamella only of it remained: The finger being now withdrawn, the protruded parts were returned with great ease, the ligament at its weakened part yielding gradually as the necessary pressure was applied for the reduction of the intestines.

As in this manner the opening may be enlarged to any necessary extent, and as the spermatic vessels and epigastric artery are thus effectually avoided, the operation for this species of hernia may not only be
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done with equal certainty, but with the same degree of safety, as for any other kind of rupture. For, by not penetrating with the scalpel through the whole thickness of the ligament under which these blood-vessels lie, they are thereby kept free from all kind of danger during this part of the operation; and, the pressure to be afterwards used for the reduction of the protruded parts, if done in an easy gradual manner, as it ought always to be, can never injure them materially; as blood-vessels of the size and strength of which these are, easily admit of a degree of extension much more considerable than can be here required.

The femoral hernia being in other respects perfectly similar to the inguinal, and the mode of treatment applicable to the one, being in every other circumstance equally so to the other, it is not necessary to say any thing farther here concerning it: Only we may remark with respect to bandages for retaining the dressings, both in this and every other species of hernia,
except

except in the bubonocele, as last described, in which the ordinary suspensory bandage of the scrotum answers the purpose in a very easy effectual manner, that in no other situation can a bandage be applied, without being productive of much inconvenience. For instance, the Spica, as it is termed, which after the operation of the crural hernia used always to be employed, can never be applied but with much difficulty; nor does it answer the purpose properly: Instead of this or any other bandage, a piece of thin leather spread with any plaster moderately adhesive, being applied over the dressings, retains them more effectually, and with much more ease.

We have elsewhere remarked, that from the particular conformation of the parts concerned in this disease which is found to take place in females, women are more liable to it than men. In them the same means of relief, and the same mode of operating, ought to be employed as

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we have already advised for male subjects. For, as the same risk occurs here of wounding the epigastric artery, the same precautions are necessary for avoiding it; and by attending to the directions we have given upon this point, this may be always done with certainty.

SECTION V.

Of the Exomphalos, or Umbilical Rupture.

IN this species of hernia, the parts protruded from the abdomen pass out at the umbilicus; and the contents of the hernial sac are here, as in every other kind of rupture, exceedingly various. On some occasions they consist of intestines only; sometimes of omentum only; and frequently of both. At other times, again, part of the stomach, the liver, and even the spleen, have been found in the sac of an umbilical rupture.

As all the parts we have now mentioned, are, while in the abdomen, contained in the peritonæum, the hernial sac,

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it is evident, must be here formed as well as in other ruptures, by that membrane being carried along with such parts as are protruded. Accordingly, in every recent instance of umbilical hernia, this sac is in general very evident; but when the tumor has become considerable in size, by a long continuance, and the great weight of its contents, the sac, by the pressure thus produced, becomes so connected with the neighbouring parts, that by many it has been doubted whether this species of hernia has a sac or not. In ruptures of this kind the swellings sometimes increase to such a degree, as actually to burst the surrounding parts; not only the sac, and cellular substance, but even the skin itself.

This disorder occurs most frequently in infancy, soon after birth; and corpulent people are more liable to it than those of a contrary habit, from this evident reason, that in the former, by the great bulk of contained parts, the surrounding muscles are kept constantly distended, and the

open-

opening at the umbilicus through which the parts are protruded, is thereby made more pervious: For the same reason too, women in the last months of pregnancy are particularly liable to umbilical ruptures.

If the disorder is attended to in due time, a bandage properly fitted to the parts will commonly effect a cure; and, in such swellings as occur in pregnancy, a removal of the disorder, is, in general, a certain consequence of delivery. But even in cases of umbilical hernia in pregnant women, by employing a bandage on the first appearance of the disease, and by persevering in the use of it for a proper length of time, although a cure may not be obtained till delivery, the disorder will at least be prevented from receiving any farther increase. Both in male and female patients, due attention to the use of a truss is absolutely necessary in every case of hernia; but as in this species of the disease the swelling and different symptoms are always greatly aggravated by pregnancy, women in that state

state ought to be particularly attentive to the smallest appearance of every swelling of this nature.

Although in some instances of umbilical ruptures, different portions of the alimentary canal are found to be protruded; yet by experience we know, that the omentum alone is much more frequently protruded than any of the other viscera: And hence umbilical herniæ in general, are not productive of such bad symptoms as usually occur in the other kinds of rupture.

It happens, however, as we have already observed, that in some cases a portion of gut alone is pushed out, by which the usual symptoms of a strangulated hernia are apt to be induced. In which event, when the means usually employed for returning the gut into the abdomen do not succeed, as a stricture of the passage through which the gut has fallen, is to be considered as the cause of the disorder; so a cure, it is evident, must depend entirely on a thorough removal of that stricture. In performing this operation, a free external incision along

the course of the tumor, is the first step to be taken; and on laying the protruded parts bare by a cautious division of the sac, if they are found in a state proper to be returned, and if that cannot be effected without making an enlargement of the passage into the abdomen, this may be done with great safety by introducing the finger, and enlarging the opening as far as is necessary with the blunt-pointed bistoury. This incision, we may remark, may be made with almost equal safety in any direction; but lest the ligament formed by the umbilical vessels should be wounded, which, however, would not probably occasion much injury, yet if any person is apprehensive of danger from that circumstance, it may be always avoided by making the incision on the left side of the umbilicus, and carrying it a little obliquely upwards and outwards.

When, again, the prolapsed parts, on being laid open, are found to be so far diseased as to render their reduction improper, the directions formerly given for
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the treatment of similar occurrences in other cases of hernia, apply with equal propriety here, so that they need not now be repeated.

By Albucasis, Guido, Aquapendens, and other authors, it has been proposed, with a view to obtain a radical cure without having recourse to the operation, to lift up the skin covering the tumor, with the finger and thumb, so as to separate it from the gut underneath; when a ligature is ordered to be applied round the part so held up, and to be made of such a tightness as to induce a mortification of all the parts that lie anterior to it.

In other instances again, when the form of the swelling did not admit of this, the same precaution being taken as we have directed above for avoiding the gut, a needle containing a double ligature was introduced at the basis of the tumor, near to its centre, and the ligatures were afterwards tied one above and the other below, of such a degree of tightness as to induce the wished for effect.

But as the practice thus recommended

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was not adequate to the design proposed, as it did not prevent a return of the disorder, and as the destruction of skin produced by it rendered every future descent more dangerous; so it is now, at least by regular practitioners, very universally exploded.

SECTION VI.

Of Ventral Herniae.

IN this species of hernia the parts forming the swelling are protruded between the interstices of the abdominal muscles. No part of the abdomen is altogether exempted from the occurrence of such tumors, but they are most frequently observed in some of the parts most contiguous to the linea alba; and when the stomach alone happens to form the tumor, the swelling is situated just under, or immediately to one side of the xiphoid cartilage.

The treatment of this kind of rupture corresponds exactly with that of exomphalos. When the parts are reducible by the hand

hand merely, a cure may be frequently obtained by the constant use of a truss; and, again, when symptoms of strangulation occur, which cannot be otherwise removed than by an incision through the stricture, this must be done in the manner directed in the last Section, so as to admit of the parts being replaced. The after-treatment of the parts concerned in the operation, is the same here as in other kinds of rupture.

SECTION VII.

Of the Hernia of the foramen Ovale.

IN this variety of rupture, the viscera protrude through the foramen ovale of the pubis and ischium. It is not by any means a frequent disorder; but, as it does sometimes occur, it is necessary here to describe it.

The symptoms in this kind of hernia being very similar to those produced by the strangulation of intestines in other parts, it is not necessary to enumerate

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them:

them: Only it is proper to remark, that in this rupture the tumor is in men formed near to the upper part of the perinæum; and in women, near to the under part of one of the labia pudendi. In both sexes it lies upon the obturator externus, between the pectinæus muscle and the first head of the triceps femoris.

The foramen ovale being partly filled up by a membranous or ligamentous substance, and in part by the obturatores muscles, it was commonly supposed that this species of hernia arose from a relaxation of one or other of these; but as an opening is left in the foramen for the transmission of different blood-vessels and nerves, it is now known, that in this disorder the viscera pass out at that opening, by gliding down in the course of these vessels.

The general mode of treatment as we formerly recommended for other species of hernia, must be here attended to; and when the parts are reduced, a truss properly adapted to the parts, must be trusted

to

to for their retention. But as it will sometimes happen in this, as in every other case of hernia, that reduction cannot be effected by the hand alone, in that event the operation of dilating the passage through which the intestines protrude, is the only resource. The tumor, however, that occurs in this disorder, being in general so small as scarcely to be noticed but by the most minute examination, unless a local pain, with the usual symptoms of a strangulated gut lead to its detection, it is seldom discovered from its size, till it is too late to expect much assistance from art.

But whenever the operation becomes necessary, as it must always be when symptoms of strangulation are discovered to have arisen from a portion of gut being protruded, and which cannot by any other means be removed; in such an event, after carefully laying the prolapsed parts freely bare, if they cannot then be reduced but by dilating the passage, and as death must be the certain consequence if that should not be effected; it ought at all events

to be attempted: But as here it is almost impossible to enlarge the opening by means of any sharp instrument, without dividing some of the blood-vessels which pass out at the foramen; and as such an occurrence, from these vessels being of a considerable size, would of itself, in all probability, end in the patient's death, the depth and situation of the parts rendering the application of a ligature impracticable; it is more advisable, by means of such a flat hook as is represented in Plate IX. fig. 2. to dilate the passage to a sufficient size by gentle gradual stretching. By insinuating the end of the hook between the intestine and ligament, and pulling it gradually from without inwards, a degree of dilatation may be obtained sufficient for the reduction of the gut, without incurring that hazard which the division of the ligament with the knife or any sharp instrument must always occasion.

SECTION VIII.

Of the Hernia Cystica, or Hernia of the Urinary Bladder.

IN this species of rupture, the urinary bladder is the organ protruded; and the situations in which it occurs, either in the groin and scrotum, through the opening in the external oblique muscle of the abdomen; in the fore-part of the thigh, under Poupart's ligament; or in the perinæum, through some of the muscular interstices of that part*. Instances have occurred, too, of the bladder being pushed into the vagina, so as to form hernial tumors of no inconsiderable degrees of magnitude.

As only a part of the bladder is covered with the peritonæum; and as the bladder, in order to get into the opening in the external oblique muscle, or under the ligament of Fallopius, must insinuate itself between that membrane and the abdominal muscles; it is evident, that the hernia

* An instance of this is recorded in Vol. IV. of *Memoires de l'Academie Royale de Chirurgie*, by Mons. Pipelet le Jeune, p. 181.

hernia cystica cannot be covered with a sac, as intestinal ruptures usually are. In the perinæum, again, that portion of the bladder most liable to fall into it, is in no way connected with the peritonæum. On some occasions, this species of rupture occurs by itself, without any complication; and on others it is found to be accompanied with intestines and omentum, both in inguinal and femoral herniæ: When complicated with a bubonocele, that portion of the bladder which is protruded lies between the hernial sac and spermatic cord; that is, the intestinal hernia lies anterior to it.

The usual symptoms of this species of hernia are, A tumor, attended with fluctuation, either in the groin, in the fore-part of the thigh, or perinæum, which generally subsides when the patient voids urine. When the swelling is large, before water can be made with freedom, it is commonly necessary to have recourse to pressure, at the same time that the tumor, when in the groin or thigh, is as much elevated as possible; but when the swelling

swelling is small, and especially when no stricture is as yet produced, the patient generally makes water with great ease, and without any assistance from external pressure.

When a hernia of the bladder occurs without any complication, it is commonly found to proceed from a suppression of urine. In the treatment, therefore, every cause of suppression ought as far as possible to be guarded against; and when no adhesions take place, and if the protruded portion of bladder can be reduced, a truss properly fitted to the part, should be wore for a considerable length of time: And, again, when the parts cannot be reduced, as long as no symptoms occur to render the operation necessary, a suspensory bag, so fitted as effectually to support the prolapsed parts, while at the same time it does not produce severe pressure, is the only probable means of relief. When, again, a portion of bladder happens to protrude into the vagina, after reducing the parts, which is done by laying the patient on her

back



back with her loins somewhat elevated, and pressing with the fingers from the vagina, descents in future may in general be effectually prevented by the use of the pressary represented in Plate IX. fig. 1. And the same means, we may remark, are employed with success in preventing a falling down of part of the intestinal canal into the vagina; a species of rupture which now and then occurs.

It may happen, however, that the prolapsed parts, by being attacked with inflammation and pain in consequence of stricture, may render the division of the parts producing these symptoms as necessary in this as in any other case of hernia; in which event, the directions given in the preceding sections for the treatment of intestinal herniæ, will be equally applicable here.—Only it must be remembered, that as in the hernia cystica without any complication, the protruded parts are not covered with a sac; so a still greater degree of caution is necessary in laying them bare,

Plate IX.

Fig. 1.



Fig. 2.



Fig. 4.



Fig. 3.



Abbott Sculp.



bare, than in the ordinary kinds of rupture.

It sometimes happens, that stones are produced in that portion of the bladder which remains protruded; in which event, if it should ever become necessary to cut into them, if the bladder can be easily retained in its prolapsed state till the wound is healed, it ought always to be attempted, in order to prevent that extravasation of urine internally which would otherwise occur, and which in all probability would do mischief. The same precaution, too, becomes necessary, if, either by accident in the operation for the hernial cystica, the bladder should be cut into; or if any part of it has been found mortified, so as to render it improper to return it into its usual situation *.

C H A P.

* The best accounts to be obtained of the various species of hernia may be had in the works of Le Dran, Heister, and of Mauchart in a treatise *De Hernia Incarcerata*; in the different volumes of *Memoires de l'Academie Royale de Chirurgie* of Paris; in the Medical Essays

C H A P. VI.

Of the HYDROCELE.

SECTION I.

General Remarks on the Hydrocele.

EVERY tumor formed by a collection of water, might, from the import of the word, be with propriety denominated

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says of Edinburgh; in the Works of the late Dr Monro; in Haller *De Hernia Congenita*, in his *Opuscula Pathologica*; in Mr John Hunter's very accurate account of the state of the Testis in the Fœtus in Dr Hunter's Medical Commentaries; and in Mr Pott's valuable Treatise on Ruptures. These are the best modern authors on this subject; and very little satisfaction is to be got from any of the ancient writers upon it.

a Hydrocele; but the chirurgical acceptation of the term, implies a watery swelling situated in the scrotum or spermatic cord.

Swellings of this kind, as well as every other species of tumor in the scrotum or groin not immediately produced by the protrusion of parts from the abdomen, are by ancient writers termed False or Spurious Herniæ, in opposition to those described in the last Chapter, which they distinguished by the appellation of *True Herniæ*.

No real utility, however, is derived from this distinction; and as it arose from a very erroneous notion which prevailed of the origin of these disorders, we should not have thought it necessary to mention it here, but with a view to render intelligible the ideas of ancient writers upon this subject.

Indeed, the opinions concerning these diseases, as handed down to us by all the older writers, by which I mean those of the last and former centuries, are in general so confused and perplexed, that few of them

them are worth much attention : For, as they were very ignorant of the anatomy of the parts concerned, the ideas they formed of the situation of the diseases to which they are liable, were so erroneous, that the practice built upon them came to be very pernicious.—So little were they acquainted with the structure of these parts, that they proceeded with much unnecessary dread in the treatment of their disorders ; for, by supposing an immediate connection to subsist between the coats of the testicle, the cavity of the abdomen, liver, kidneys, and other viscera, they were induced to consider the collections of water that occur in the hydrocele, as depositions from these parts, and as tending to free them, and perhaps the system at large, from some important disorders. Different passages in Hildanus, Lanfranc, Fabricius, ab Aquapendente, and even in Dionis's works, show this to have been the idea of practitioners in the times of these authors.

In consequence of this, their practice became timid and undecided ; so that every chirur-

chirurgical operation, in which those parts were concerned, became a matter of great importance to resolve upon, and very tedious, painful, and uncertain in the execution.

From the time of Celsus to the middle of the last century, very little progress seems to have been made in reducing the knowledge of these diseases to greater certainty. Indeed, from Celsus downwards, authors seem to have copied almost exactly from one another, till Wiseman, Le Dran, Garengeot, and Heister, gradually elucidated the subject: but they were never clearly and accurately described, till the discoveries of Monro, Haller, Hunter, and Pott, rendered the anatomy of the parts concerned plain and intelligible. So much attention, however, is still given to the confused accounts of these parts handed down by ancient writers, that the real nature of the disorders of the testicle and its appendages is less understood than it otherwise would be. There is no part, indeed, of chirurgical pathology, of which

students in general are so ignorant as of this; and hence their notions of these diseases, and of the anatomy of the parts in which they are seated, are commonly very indistinct.—Nothing but a strict attention to the discoveries of late anatomists can convey clear and distinct ideas concerning them; and whoever will make himself thoroughly acquainted with these, will find, that the hydrocele, and other disorders to which these parts are liable, are explained with as much clearness and simplicity as any other disease incident to the human body.

We have already, in the beginning of the preceding Chapter on Herniæ, given a description of these parts, so far as related to that class of diseases. To what was then said, we must now beg leave to refer; but before proceeding to treat farther of the disorders now under consideration, we shall first enumerate such particulars relating to the structure of the parts concerned as were not formerly necessary to be mentioned.

In

In the anatomical description already given of these parts, we made it appear, that on the testes with their blood-vessels descending to the groin and scrotum, as they were while in the abdomen surrounded by the peritonæum in the same manner with the other viscera, and as in their descent they bring a process of the peritonæum along with them, so when in the scrotum, that they still remain in the cavity of that membrane.

At the time of their falling down, and for a short while after, a direct communication subsists along this process of the peritonæum between the testes and viscera in the abdomen; but soon after this, except, as we formerly observed, in the case of a congenital hernia, the superior part of the passage begins to contract, and in a short time is entirely obliterated, from the opening in the external oblique muscle down along the spermatic cord, to the upper part of the epididymis; the under part of the process continuing loose and open. In this manner the inferior ex-

tremity of the process is converted into a kind of bag, the tunica vaginalis testes.

From the description formerly given of these parts it appears, that the testis while in the abdomen is at its back-part firmly connected to the peritonæum, at which part the blood-vessels, nerves, and vas deferens, communicate with it; so when in the scrotum, as the vaginal coat with which it is there surrounded is evidently a process or continuation of the peritonæum, it must of necessity be still connected with that membrane in the same manner as while it remained in the abdomen. And accordingly we find, that although the testicle lies loose in this sac or vaginal coat in every other part, yet all along its posterior part it is firmly attached to it. At this part the different vessels of the testis still enter; and at this part the peritonæum, or what is now the tunica vaginalis, is reflected over it, thereby forming the tunica albuginea, or immediate covering of the testicle; so that the latter, viz. the tunica albuginea, is demonstrably a mere continuation of the former or vaginal coat.

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The inferior part of the peritonæal process being somewhat wider below than above, leaves the tunica vaginalis of a pyramidal form; and it is also somewhat longer than the testis, reaching from the superior part of the epididymis, where it begins, to a little below the inferior point of the testicle, where it terminates. It is altogether of such a size as to allow the testis to roll easily within it; its principal use appearing to be, to retain a small quantity of a fine exhalation, which is constantly secreting, either from its own surface, or from the surface of the testis itself, for the purpose of keeping the latter moist and easy.

This vaginal coat which we have now described is the only loose covering belonging either to the spermatic cord or to the testis: For although, by many writers on this subject, a vaginal coat of the cord is also described, together with a supposed septum between it and the vaginal coat of the testis; yet no such covering is, on dissection, found to exist. The superior part

of the peritonæal spermatic process, we have already seen, is entirely closed up very soon after the descent of the testicle; and a firm adhesion being produced between the sides of the sac all along the course of the cord, no vestige whatever can be traced, either of a vaginal coat of the spermatic cord, or of any particular septum between that and the testicle: This it is of some importance to attend to, as the diseases of these parts cannot otherwise be properly understood.

As the diseases we are now to treat of are chiefly seated in the coverings of the testis, we have been more particular in rendering their structure clear and obvious, than is necessary in describing the testicle itself; with respect to which we shall only observe, that it is evidently very vascular, being composed almost entirely of different convolutions of blood-vessels.

Besides the vaginal coat proper to each testicle, the two testes have for their farther protection a more external covering, the scrotum: A bag formed almost entirely

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ly of skin and cellular substance; for that body the dartos, which has commonly been supposed to be muscular, is now clearly proved to be altogether cellular.

Even the septum scroti, or that membrane which divides one testis from another, is composed of cellular substance in a more condensed state. By air it is easily inflated, and it is equally pervious to water: so of course it partakes of all those watery effusions to which the more external parts of the scrotum are liable.

It is very necessary to be acquainted with this structure of the scrotum, as from the descriptions which till of late have been given of it, young practitioners are induced to consider it as muscular, and to suppose the septum with its rapha to be ligamentous; and hence they are led to be more cautious than they need be in performing operations upon it.

We have thus entered with as much minuteness into the anatomy of these parts as is necessary for understanding their diseases; and the nature of this undertaking

not admitting of a more particular discussion, we shall now proceed to consider the different species of the hydrocele, the immediate object of this chapter.

All the varieties of the hydrocele which have been mentioned by authors, may, I think, be comprehended under the two following species, viz. the anasarcous, and encysted. In the former, the water is diffused over all the substance of the part in which it is seated; the swelling is not collected in any particular cavity, but occupies equally all the cells of the part: In the latter, viz. the encysted, the water is collected in one distinct bag; and a fluctuation of a fluid is in general perceptible to the touch.

The scrotum, with its contents the testicle and its appendages, are liable to both species of the disorder; and the spermatic cord with its coverings are also liable to both. We shall first treat of the scrotal affections of this kind,

SECTION II.

Of the Anasarcous Hydrocele of the Scrotum.

THE scrotum, from being entirely cellular, and connected immediately with the trunk of the body, is rendered liable to partake of every diffusible swelling with which the general constitution is attacked: And accordingly we find, that anasarcous swellings of other parts of the body, seldom subsist for any length of time, without producing a similar affection of the scrotum. A local anasarcous fullness of the scrotum unattended with any general affection, has on some occasions indeed been produced by a local cause; viz. by the accidental pressure of a tumor on the lymphatics of the part; by external injury; and by an effusion of urine from a rupture of the urethra: but such occurrences are very rare, a general disease of the constitution being the usual forerunner of such tumors.

As soon as water is collected in any considerable quantity in the scrotum, a soft, inelastic,

inelastic, colourless tumor is observed over the whole of it; pressure of the finger or of any hard body is easily received, and the mark of such pressure is for some time retained by it: The skin at first preserves its natural appearance; and the rugæ of the scrotum, which in a state of health are always remarkable, are not for some time much altered; but as the swelling advances they gradually disappear, till at last they are totally obliterated: The swelling, from being at first soft and of a doughy feel, by degrees turns more firm; and the colour of the skin from being for some time very little altered, at last acquires an unnatural white, shining appearance. As the disorder increases, the tumor by degrees becomes larger; and from being originally confined to the usual boundaries of the scrotum, it at last spreads up the groin; and the penis being likewise affected, becomes so swelled and distorted, as to be productive of much inconvenience and distress: And although the scrotum is composed of parts which readily admit of extensive dilatation, yet in

in some instances the swelling here becomes so enormous as to burst the surrounding parts entirely.

The various appearances we have enumerated are so characteristic of the disease as to render it almost impossible to confound this species of swelling with any other tumor to which the scrotum is liable.

We have already observed, that instances now and then occur of the scrotal anasarca being produced by a local cause; but by much the greatest proportion of all such cases depend upon a general hydroptic tendency; so that the cure of this kind of hydrocele must depend almost entirely on the removal of that habit of body which originally produced it.

The treatment of the general disorder of the constitution falls to the province of the physician, so we shall not here enter into the consideration of it; but the assistance of Surgery is frequently required for relieving that great distress which these tumors always produce when they arrive

arrive at any considerable degree of magnitude.

In such circumstances, the object of Surgery is, by drawing off the water from the tumor, to diminish the size of it as much as possible ; which not only affords much immediate relief, but is a means of the distended parts recovering their tone more readily than they otherwise would do.

Different methods have been proposed for evacuating the water, viz. by the introduction of a seton, by the trocar, by incisions, and by punctures.

All these methods, that by the trocar excepted, serve very effectually to evacuate the diffused water ; and therefore we are to adopt that mode which not only creates least pain, but which is least liable to be productive of troublesome consequences : And this unquestionably is the method by punctures.

The seton and long scarifications may evacuate the water somewhat more quickly than punctures ; but in dropsical constitutions, such as this species of hydrocele is

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commonly connected with, they almost constantly go wrong.

For the first twenty-four hours or so, scarifications give the patient much satisfaction ; the water is almost entirely evacuated, the tumor is of course greatly diminished, and much relief is thereby obtained. About this time, however, the scarified parts commonly begin to fret, their edges turn hard and inflamed, and by degrees an erysipelatous kind of redness spreads over the neighbouring parts.

That fretful uneasiness which was at first complained of, by degrees turns into what the patient terms a burning kind of pain, which frequently becomes so tormenting as to destroy rest entirely ; and it but too commonly happens, that all the applications employed for relief, have no manner of influence in preventing the accession of gangrene, by which the patient is at last in general carried off.

I will not say that such symptoms are always induced by scarifications, but I have in many instances observed them ;
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and on the contrary, although punctures do now and then terminate in the same manner, yet they are by no means so ready to do so *.

As scarifications are so apt to produce mischief here, there is much reason to suspect that either the trocar or seton, which both give still more irritation, would commonly prove more hurtful. They are now accordingly in this species of the hydrocele very generally laid aside.

When scarifications are to be employed, the method of doing it is, with the shoulder of a lancet to make two or three incisions on the most depending part of the scrotum, each of an inch in length, and extending no deeper than the cutis vera: And when punctures are to be depended on, they are likewise to be made of this depth with the point of a spear-pointed lancet; and five or six on the most prominent part of the tumor will commonly prove sufficient. This number will in general

* Vide Le Dran's Operations, with Chefelden's notes, p. 116; and Treatise on Hydrocele by Mr Pott, p. 40.

neral evacuate the water very quickly; but when they do not prove fully adequate to the effect proposed, or when in the course of a day or two, these now made are found to heal, they may be renewed from time to time as often as is necessary.

Preserving the parts as dry as possible, by a frequent renewal of dry soft linen cloths, in order to imbibe the moisture, is here a very necessary piece of attention; the want of it, I am convinced, is the cause of much of the mischief that frequently ensues from operations of this kind.

When either scarifications or punctures go wrong, by beginning to inflame and turn painful in the manner we have described; instead of the warm emollient poultices and fomentations usually employed, a cold solution of saccharum saturni, applied upon soft linen, not only proves more effectual in putting a stop to the farther progress of the inflammation, but affords more immediate relief to the present distress. Aqua calcis employed in
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the same manner proves also a very useful application.

When, however, the disorder proceeds to gain ground, by a real mortification coming on, we should immediately have recourse to bark and other remedies usually employed in such affections. But as we have elsewhere treated fully upon this subject, it is unnecessary to enter into a more particular consideration of it here *.

It may only be proper to observe, that although in general, when the scrotum in this disease happens to mortify, the greatest danger is to be dreaded; yet now and then very unexpected cures are obtained, after all the teguments have been destroyed by mortification. A remarkable case of this kind occurred some years ago in the Royal Infirmary here: The whole scrotum separated, and left the testicles quite bare. During the time that the sore remained open, all the water collected in other parts of the body was evacuated, and

by

* Vide Treatise on Ulcers, &c. Section IV. *On Mortification.*

by the use of large quantities of bark and mild dressings to the sore, the patient got well. In the course of the cure, the testis became enveloped with a kind of cellular substance, which served as a very good means of protection. It must have been some production of this kind, I suppose, which Hildanus speaks of as a regenerated scrotum*.

We have already observed, that although this species of hydrocele for the most part depends upon a general dropsical tendency, some instances, however, occur, of a local cause producing a mere local dropsy of the scrotum. Thus it has been known to happen, from swellings in the groin and in the abdomen obstructing the passage of the refluent lymphatics. When this is the case, if the tumors producing such obstructions can be extirpated, no other means will afford such effectual relief; but when they are so deeply seated as to render any attempt for removing them improper, the practice we have already pointed out, of

VOL. I. C c punctures

* Observat. Chirurg. tent 5. obs. 76.

punctures in the most depending part of the tumor, must be employed with a view to palliate such symptoms as occur.

It sometimes happens in cases of suppression of urine, either from caruncles in the urethra, from stones impacted in it, or from collections of matter, that the urethra bursts, and the urine in this manner finding a passage into the scrotum, an ana-sarcous swelling of it is thus suddenly produced, which still continues to increase till the cause giving rise to it is removed *.

In order to prevent the formation of sinuses, which in such circumstances will otherwise be apt to occur, an incision should be made into the most depending part of the scrotum, and carried to such a depth as is sufficient for reaching the wound in the urethra. In this manner a free vent will not only be given to the urine already diffused, but the farther collection of it may very probably be prevented. If a stone impacted in the urethra is found to be the cause

* The works of the late Dr Alex. Monro, p. 569.

cause of this effusion, it ought to be cut out ; if a collection of matter is discovered, the abscess should be opened ; and if the obstruction is produced by caruncles in the urethra, bougies should be employed for their removal.

The cause being thus removed, if the patient's habit of body is good, and untainted with any venereal or other general affection, by dressing the sore properly with soft easy applications, the opening into the urethra will probably be brought to heal, and a complete cure will be in this manner obtained. But when such ailments are complicated with any general disorder of the system, particularly with old venereal complaints, it frequently happens, that neither mercury nor any other medicine has much influence in removing them.

Every practitioner must have met with instances of this kind. Both in the hospital and in private I have met with such cases, where, notwithstanding all the means employed for relief, the passage

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from the urethra remained open, and continued to discharge considerable quantities of urine.

Instances of the scrotal anasarca of a local nature, have also occurred, from the rupture of a hydrocele of the tunica vaginalis testis: When this species of hydrocele arrives at a great size, jumping from a height, or a violent blow or bruise of any kind, will readily burst it; and the water not finding a passage outwardly, must necessarily diffuse itself over the whole scrotum. Different instances of this kind have been met with; two of which are related by Douglass *. And the same kind of swelling has been produced by the water of a hydrocele of the vaginal coat being improperly drawn off by the operation of tapping. When the orifice in the skin is allowed to recede from the opening into the vaginal coat before the water is all discharged, the remainder of the collection is very apt to diffuse itself through all the cellular substance of the scrotum.

In

* *Treatise on the Hydrocele*, by John Douglass,
p. 8.

In whichever of these ways the swelling is produced, the cure ought to consist in laying the tumor sufficiently open, not only for evacuating the diffused water, but for effecting a radical cure of the hydrocele of the tunica vaginalis.

We have thus enumerated all the varieties of anasarcaous swellings to which the scrotum is liable, together with the modes of treatment adapted to each: For with respect to the hydrocele of the dartos, a disease particularly described by ancient writers, as that part of the scrotum is now known to be altogether cellular, so any water collected in it must tend to form that very disease we have now been describing, an anasarcaous swelling of the whole scrotum.

We now proceed to the consideration of that species of the disorder, which, from its being seated within the cavity of the scrotum, we have termed the *encysted hydrocele of the scrotum*. Of this there are two varieties, viz. the hydrocele of the tunica vaginalis testis; and that species of

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tumor formed by water collected in the sac of a hernia.

SECTION III.

Of the Hydrocele of the Tunica Vaginalis Testis.

WHEN treating of the anatomy of these parts, we remarked, that in a state of health an aqueous secretion is always found in the tunica vaginalis ; the principal use of which seems to be, to lubricate and keep the surface of the testicle soft and easy.

In a healthy state, this fluid is absorbed by the lymphatics of the part; its place being as constantly supplied by a fresh secretion: But in disease, it frequently happens, either that the secretion of this fluid is morbidly increased, or that the powers of the absorbing vessels of the part are diminished. The effect of either of these causes must be, to induce a preternatural collection of water in the cavity of the vaginal coat; and by a gradual accumulation of this fluid, the species of hydrocele which we are now considering will be at last

last produced. The symptoms and appearances of the disorder are as follow.

A fulness is at first observed about the inferior part of one of the testicles, which is at this time soft and compressible; but as the tumor increases in size, it also becomes more tense: No degree of pressure can make the swelling disappear either at this or any other period of the disease: The teguments at first preserve their natural appearance, both as to colour and rugosity; but as the water accumulates, the skin gradually becomes more tense, although seldom or never to such a degree as to obliterate the rugæ of the scrotum entirely.

The shape of the tumor, which was at first nearly globular, becomes gradually more pyramidal, being larger below than above: In the first stages of the disorder, the swelling does not extend farther than the usual boundaries of the scrotum; but in process of time, it advances by degrees up to the abdominal muscles; so that altho' in the early period of the disease, if it be

not combined with hernia, or with a hydrocele of the cord itself, the spermatic process may be always distinctly felt; in its more advanced state it cannot possibly be distinguished. The weight of the tumor being now very great, the skin of the neighbouring parts is dragged so much along with it as to cause the penis to shrink considerably, and sometimes to disappear almost entirely: And in this advanced state of the disease, the testicle, which usually lies at the back part of the tumor, and which for some time after the commencement of the disorder could be distinctly felt, cannot now be evidently discovered. On a minute examination, however, a hardness is always to be felt along that part of the scrotum where the testis is situated: And a fluctuation of a fluid may in general be distinguished through the whole course of the disease.

It sometimes happens, however, in that very tense state of the tumor, which a long continuance of the disease usually occasions, that the fluid contained in it cannot be evidently distinguished: Nor in this situation

tion is the ordinary characteristic mark of hydrocele more to be depended on; I mean, the transparency of the tumor when exposed to the light of a candle or of the sun. In the early stages of the disease, when the contents of the tumor have not become discoloured, and when the vaginal coat has not yet acquired much thickness, the contained fluid, on being exposed to this trial, always appears transparent; and when it does so, it always affords a corroborating proof of the existence of water: yet its absence is by no means a proof of the contrary; for as the transparency of the tumor depends entirely on the nature of its contents, and on the thickness of its coverings, whatever tends to render the one less clear, and the other of a more firm texture, must in proportion to this effect invalidate the certainty of the test.

During the whole course of the disorder the patient does not complain of pain in the tumor itself; but some uneasiness is commonly produced in the back, by the weight of the swelling on the spermatic cord:

cord: this, however, is generally either prevented altogether, or is at least much alleviated, by the use of a proper suspensory bandage.

These are the usual appearances of a hydrocele when the disease is confined to one side of the scrotum, which is generally the case. But on some occasions a double hydrocele is met with, in which both testicles are affected in the same manner; and in which the tumor, instead of being confined to one side of the scrotum, occupies the whole of it equally.

As there are some disorders with which this species of hydrocele is apt to be confounded, it is particularly necessary to attend to such circumstances as most readily characterise it. These disorders are, All the variety of scrotal herniæ; the anasarcus hydrocele of the scrotum; the encysted hydrocele of the spermatic cord; the farcocele, or scirrhouss testicle; and the hernia humoralis, or inflamed testis.

When treating of herniæ, we enumerated such circumstances as, when properly considered,

sidered, will almost always serve to distinguish this species of hydrocele from every variety of these disorders: To what was then said, we must here therefore refer *.

It has on some occasions, we are told, been confounded with the anasarcous tumor of the scrotum; but the means of distinguishing the two diseases are so evidently pointed out in the histories we have given of their appearances, as to render it quite unnecessary to enter farther into their consideration. Indeed it must be gross inattention only, which can ever render the anasarcous species of hydrocele liable to any degree of doubt.

From the encysted hydrocele of the spermatic cord, it may commonly be easily distinguished, by the testicle in the latter being plainly felt at the under part of the tumor; whereas in this disease, when the testis is perceptible, it is always at the back-part of it: And in this species of hydrocele, the swelling begins in the under part of the scrotum, and proceeds upwards;

* See p. 313.

wards : whereas in the encysted hydrocele of the cord, it makes its first appearance above the epididymis, and by degrees falls down to the inferior parts of the scrotum. By this difference alone these two species of hydrocele may be always distinguished from one another.

The circumstances which most clearly distinguish this kind of tumor from a scirrhouſe testicle, are these : In the latter the swelling is hard and firm ; it does not yield in any degree to pressure ; the surface of the tumor is rough and unequal ; it is in general attended with a good deal of pain, and is always heavy in proportion to its size. Whereas in the hydrocele, the swelling commonly yields to pressure ; its surface is smooth ; little or no pain takes place ; and the tumor is light in proportion to its bulk.

These differences will always serve as a sufficient means of distinction between this species of hydrocele and a pure unmixed farcocele. But when a scirrhouſe testicle is combined with an effusion of water into the

the tunica vaginalis, forming what has very properly been termed a *hydro-sarcocele*; the means of distinction are not so obvious. In the incipient state of such effusions, the difference between the two diseases is sufficiently apparent; but in the latter stages of it, the most attentive observer commonly finds it difficult, and sometimes impossible, to mark the distinction. In such doubtful cases, however, by proceeding in the cautious manner to be afterwards pointed out, no detriment will occur to the patient from any uncertainty of this nature.

From the hernia humoralis this species of hydrocele is easily distinguished. In the former, the tumor succeeds either immediately to some external bruise; or it is evidently the consequence of a gonorrhœa, or of some other inflammatory affection of the urethra *. The skin is more or less affected

* The operation of lithotomy is frequently attended with an inflammation of one, and sometimes of both, of the testicles; probably from the inflammation induced by the operation in the neighbourhood of the *caput gallinaginis*, being communicated along the *vas differens* to the testes.

ted with an inflammatory redness; it is attended with a considerable degree of pain, especially on handling; and the swelling is hard and firm; so of course no fluctuation can be distinguished in it, unless in its more advanced state, when suppuration sometimes takes place, and when the usual symptoms of abscess, particularly the pointing of the tumor, and its being much discoloured, serve to distinguish it sufficiently.

In forming a prognosis of this disease, we must be directed almost entirely by the habit of body of the patient. In general, we are to consider it as a local affection; and in that state the most favourable expectations may be formed of the event; for, whatever may have been alleged by some writers as to the hazard of every operation for a radical cure of the disorder, in a simple unmixed hydrocele, and in a sound healthy constitution, it may at any time be advised with a very fair prospect of success.

In the radical cure of the hydrocele, in whatever way it is attempted, some pain will

will be occasioned; the parts will inflame, and of course some degree of fever must be expected. In some instances, these symptoms have gone rather farther than was just necessary; but under the limitations I have already mentioned, of an unmixed state of the disorder in a constitution otherwise healthy, whenever the operation has been properly performed, I can safely aver, that of a very considerable number I have operated upon myself, as well as of many I have been connected with, I never knew one instance of any thing bad occurring.

But on the contrary, in constitutions otherwise diseased; in old people; and in infirm habits of body; we are by no means to expect such certain success: Even in such circumstances, the operation very frequently succeeds; but it must be acknowledged that it now and then fails. The symptomatic fever is apt to run too high for the strength of the patient; and the suppuration produced by a high degree of inflammation tends afterwards to destroy

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entirely the remains of a constitution already much impaired. This, however, ought not to be laid to the account of the operation, but to the real diseased state of the patient.

When, therefore, this disorder occurs in a healthy constitution, I would conclude, from all the experience I have had in it, that little or no danger is to be dreaded from any necessary operation: And on the contrary, in a diseased state of body, that some risk is always incurred by every operation that takes place; and the degree of risk we may suppose will be always in proportion to the nature and extent of that disease with which the constitution is affected.

As long as a swelling of this nature keeps within moderate limits, patients in general rather submit to the inconvenience produced by it, than undergo the pain of an operation; at least this is commonly the case among people of better rank, who can more readily put up with any distress which it occasions, than the poorer set of patients, whose daily labour is frequently impeded by

by large tumors in the scrotum. Among those of the former class, instances occur of the disorder having existed for a great length of time without being productive of much inconvenience: But even among these it commonly happens that they become anxious; fatigued with uncertainty; and are at last induced to submit to the operation.—In all such instances, when the constitution is otherwise sound, this may be undertaken, as we have already remarked, with an almost certain prospect of success; but when the system is materially diseased, a patient had better submit to any inconvenience produced by the disorder, than undergo an operation for a radical cure: And this may be the more easily agreed to, from the relief which people with tumors of this kind always experience from tapping, which is termed the Palliative Cure; and which when it is properly done, if the constitution is not greatly impaired indeed, may be always submitted to without any dread of its proving hazardous.

Various methods are proposed by au-
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thors for the treatment of this disorder. All of them, however, may be reduced to two general heads; viz. such as have in view only a temporary relief, and which, as we have just now observed, is termed the Palliative Cure; and such as are intended for effecting a Radical Cure, or a final removal of the disorder.

Whatever advantages may be experienced from the use of internal medicines in dropical affections of the constitution, no practitioner, I believe, has so much confidence in remedies of this kind, as to expect much benefit from them in any partial hydroptic collections of the encysted kind: We have daily proofs of their general failure in almost every affection of this nature; and in no species of dropsy do they prove more ineffectual than in the hydrocele.—We are told, indeed, of cures having been performed by different medicines, particularly by the use of strong drastic purgatives: I have known them employed, but never with advantage; and when pushed to any extent, they are sure

to

to hurt the constitution.—As it is always necessary however to confine the patient to bed for some time after any operation that takes place, in order to prevent his being afterwards disturbed, it is proper to empty his bowels by a laxative immediately before the operation; but this is almost the only medicine that can be requisite. Internal medicines, therefore, being found ineffectual, as well as external applications, we are to seek for that relief from Surgery which experience shows it is capable of affording.

When the tumor in the scrotum has acquired such a size as to become inconvenient, if the patient either refuses to submit to the operation for the radical cure, or if his state of health renders that operation improper, in such circumstances, the palliative treatment, or a mere evacuation of the water by puncture, is the only means we can employ.

There are two methods proposed for drawing off the water in this manner, viz. by the puncture of a lancet, or with a trocar.—It is alleged by some, that by the mere

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puncture of a lancet the water can neither be so completely or so properly drawn off as when the trocar is employed ; for the orifice in the skin being apt to recede from the opening in the vaginal coat, the water is thereby either stopt altogether, or is apt to insinuate itself into the surrounding parts. By others again it is said, that the difficulty of introducing the trocar is such as to render it hazardous from the contiguity of the testicle ; and instances are not wanting to show, that even in the hands of expert surgeons the testis has been very materially injured by a trocar reaching it in this operation. Indeed, the ordinary form of this instrument, which is triangular, renders its introduction both difficult and unsafe; but the trocar of a flat form which I proposed some years ago, enters with as much ease as a lancet.—In Plate X. different instruments of this kind are represented, of a proper size for this operation.—And as with a trocar of this kind an opening may be made into the tunica vaginalis with perfect safety, and the water with this instrument being

Plate X.

Fig. 2.



Fig. 3.



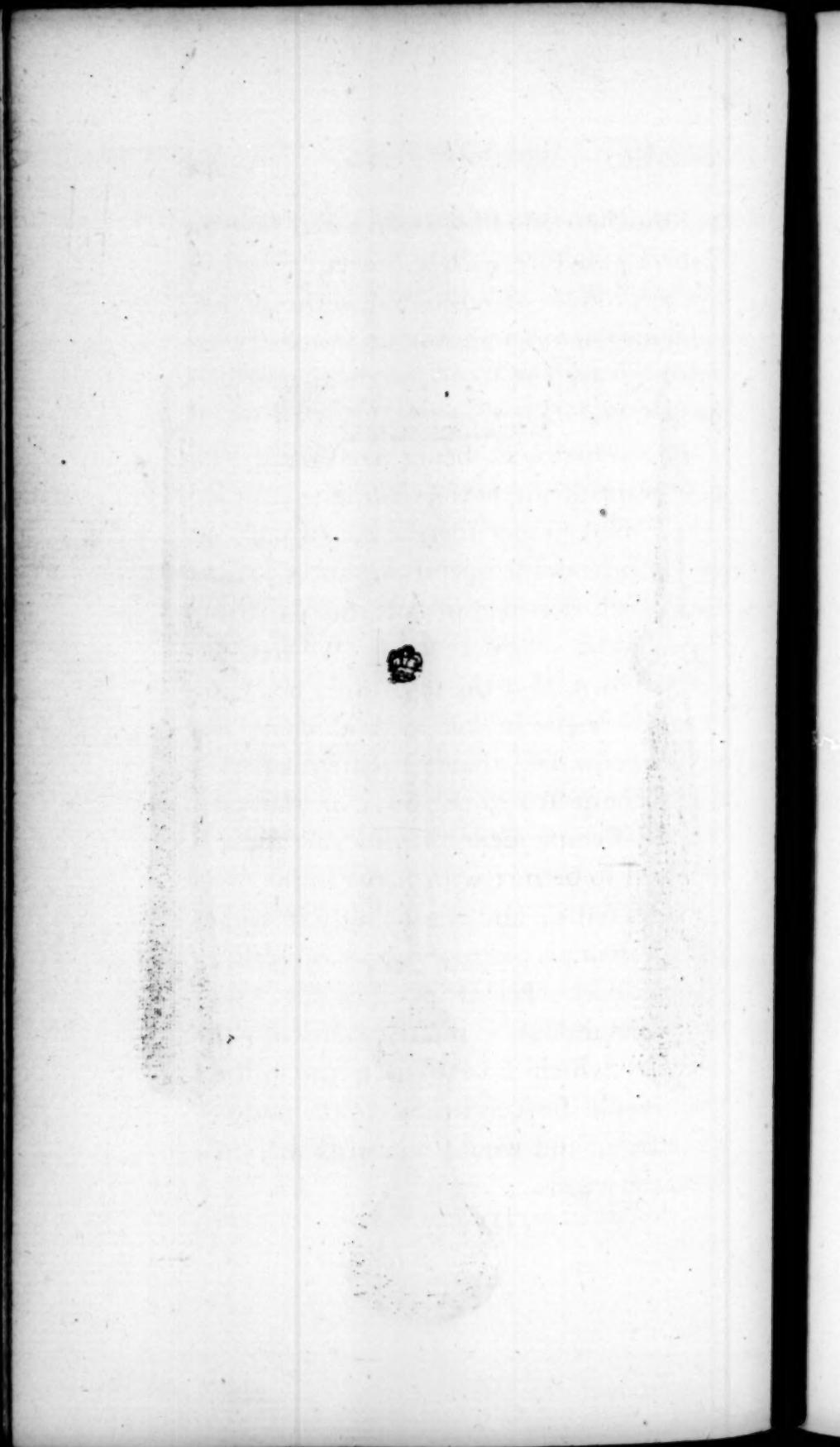
Fig. 4.



Fig. 1.



Abell Sculp?



ing much more freely evacuated than by a mere puncture with a lancet, which is apt to produce an effusion into the cellular substance of the scrotum, the mode of effecting it by the lancet ought therefore to be laid aside.

The instrument being fixed upon, the next point of importance is the part of the tumor most proper for the operation. Even in this simple operation, an acquaintance with the anatomy of the parts will appear to be very necessary. We have already shown, that the testis does not hang altogether loose in the vaginal coat; but on the contrary, that its posterior part is firmly connected to the body of the testicle; so of consequence at this part there is no water to be met with between the scrotum and testis; and accordingly it would be highly improper to attempt an opening at this place: For if through ignorance the trocar should be inserted here, one instance of which I have seen, the instrument would for certain pierce the body of the testicle, and would not, after all, evacuate the water.

The most proper part for introducing the instrument is the most anterior point of the under part of the tumor. The patient being seated on a chair, with the tumor hanging over the edge of it, the operator with his left hand should grasp the tumor on its back-part, so as to push the contained fluid as much as possible into the anterior and under part of the swelling. Having done so, he then makes an opening through the skin and cellular substance, of about half an inch in length, with the shoulder of a common lancet, on that point where the trocar is to enter. This gives very little pain to the patient; it is done in the space of a second or two, and it ensures an easy passage to the point of the instrument; a circumstance which divests this operation of all kind of hazard.

The operator now takes the trocar in his right-hand, and having fixed the head of the instrument in the palm of the hand, he places the fore finger along the course of it, leaving just as much of the point of

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the instrument uncovered as he thinks ought to penetrate the tunica vaginalis: and this being introduced in a gradual easy manner, the stilette is to be withdrawn immediately on the end of the canula having entered the cyst. The water will now run off; and if the tumor be not of a great size, it may be all evacuated at once: but when the swelling is large, as the sudden discharge of the fluid, by taking away too quickly the support which it afforded to the vessels of the testes and vaginal coat, might endanger the rupture of some of them, it is better every now and then to stop the flow of it for a few seconds; and when the whole is thus evacuated, and the canula withdrawn, a piece of adhesive plaster should be immediately applied to the orifice, and a compress of soft linen being laid over the scrotum, the whole should be firmly supported by a proper application of the T-bandage*.

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* Some very judicious remarks on the importance of a due degree of compression in such cases may be met with in Dr Monro's observations on this subject, *loci citato.*

The patient being in this state laid in bed, it commonly happens, that in a few hours all manner of uneasiness is gone, and he goes about his ordinary business without farther interruption: Now and then, however, the sore produced by the trocar festers; and the inflammation thus produced, in some instances, has been known to terminate in a radical cure of the disorder. Such occurrences, however, are rare, and are by no means to be depended on.

This operation, when done with attention, is easily performed, and is seldom productive of any mischief; but when not performed with caution, and especially when the patient is allowed to go about immediately after the water is evacuated, it sometimes terminates in very troublesome symptoms. Even when done with every possible attention, if the patient's habit of body is bad, it sometimes goes wrong. Of this every practitioner may have seen some instances more or less remarkable: And two cases are related by Mr Pott; one
of

of which terminated fatally; and in the other a mortification ensued, which in the space of a few days destroyed not only a good deal of the scrotum, but even a considerable portion of the tunica vaginalis *. Both of these indeed occurred in very unhealthy constitutions; but it is proper to have it known, that this operation may in such habits of body be productive of these consequences. In sound healthy people, it seldom or never ends in any thing bad; but the event of these cases of Mr Pott and others, ought to convince us that it should not be attempted where the system is evidently much diseased.

Drawing the water off in this manner in order to relieve the patient from the bulk it produced, was the first idea that occurred to practitioners in the treatment of the hydrocele; but this being found ineffectual for the complete removal of the disease, various other methods were afterwards introduced. The actual cautery and the ligature were both proposed as means of

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* Cases xxi. and xxii. Treatise on the Hydrocele.

preventing farther descents of water from the abdomen, which in former times was considered as the origin of this disorder. Celsus orders a cyst of a hydrocele to be cut away, and many of his followers do the same. Tents, both solid and hollow, were afterwards employed; as was likewise the use of the seton, which we find recommended by Fabricius ab Aquapendente, and other writers even of a more early period. The use of various applications of the caustic kind has at different times been in vogue: Injecting wine, diluted ardent spirits, and other irritating liquids, into an opening in the vaginal coat, has been proposed as a means of inducing a degree of inflammation sufficient for effecting a radical cure; and a simple incision of the cyst containing the water has been practised for the same purpose.

These, I think, comprehend all the variety of means which at different periods have been employed for the cure of the hydrocele. Ancient practitioners seem to have been acquainted with all of them;

but

but having very inaccurate ideas of the anatomy of the parts concerned, they could not have any fixed or clear opinion of the manner in which any of their remedies operated in effecting a cure. In consequence of this they were applied very much at random; and no method proving at all times successful, the ignorance they laboured under in the theory of the disorder rendered changes of remedies very frequent in the treatment of it.

One material advantage obtained by the moderns in this point is, that by knowing the water to be contained in a particular cyst with which no part of the body communicates, they are thereby left at liberty to apply their remedies without any dread of injuring parts which were formerly supposed to be connected with the testicle; and by finding that the water collected in this disease, is in many respects in a similar situation to the contents of other tumors, with the means of curing which they are well acquainted, they have ventured from analogy to transfer the method

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of treatment found to succeed in these disorders, to this species of the hydrocele.

Matter collected in a particular cavity or cyst, we suppose to be in circumstances very similar to water collected in the tunica vaginalis testis. In both situations the contents of the tumor are secluded from access to the external air; and neither of them have any communication with any other part of the body. And although the bag containing the matter of an encysted tumor is in some measure a new formation, yet in many instances it is found to be equally firm and elastic with the tunica vaginalis testis.

In the treatment of encysted tumors, practitioners are now agreed, that, besides evacuating the matter, means must be employed for destroying the cavity which contained it, otherwise a return of the disorder may in general be expected. To accomplish this, different methods have been proposed; some with a view to destroy entirely the cyst which contained the matter; and others, as it is said, to fill up the cavity

cavity of the cyst with a formation of new parts.

But we now know, that unless the coats of a cyst are much extended, and greatly thickened indeed, that there is no reason whatever for removing any part of it. It is also known, that to fill up the cavities of tumors with a creation of new parts, is a mere imaginary matter, being what neither art or nature ever effects to any extent: And we likewise know, that the cavity of almost every tumor may be more effectually destroyed by producing an adhesion of its fides than by any other means.

Parts of the human body in a state of inflammation very readily adhere to one another. Indeed so easily do they do so, that some art is required to prevent the adhesion of contiguous inflamed parts. By attempting the cure of abscesses and of encysted tumors, on principles analogous to this, the same phenomena were found to happen; for, after discharging their contents, it has been found, that cures are commonly obtained with more ease and

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certainty by inducing a sufficient degree of inflammation on their internal surfaces, than by any other means. And in like manner it is now known, that the hydrocele of the tunica vaginalis, may be treated upon the same principles, and with the same general effects.

This is the most simple idea that can be given, of the present views of practitioners in the treatment of this disorder; and I hope it will serve to render their ideas respecting it sufficiently clear.

The intention, then, of every means now in use for the radical cure of this species of the hydrocele, is, to induce such a degree of inflammation on the parts, as may tend to obliterate entirely the cavity of the tunica vaginalis, by making it adhere firmly to the tunica albuginea or surface of the testicle.

Some individuals, indeed, still proceed upon the supposition of a total destruction of the sac being necessary for a complete cure. But the extensive experience of many of the best employed surgeons makes it

it appear very clear that this is never necessary. When the sac has become very thick, and has been distended to such a degree as entirely to have lost its tone, removing a small part of it sometimes proves useful, by allowing the scrotum to contract more readily; but in no other point of view is it in any degree requisite.

We know well, that in this, as in every species of encysted tumor, a cure may be, and frequently is, obtained, by removing the sac entirely; for the contiguous parts from whence the sacs have been dissected, adhere very readily together, so as to destroy effectually the cavities in which the matter was contained*. But we also know that this is never necessary, as the same end may be always obtained by much more gentle means.

We shall now proceed to the particular consideration of the several means at present

* Mr Else asserts, that in the method he recommends of curing this species of Hydrocele by caustic, the tunica vaginalis sloughs entirely off.

fent employed by different practitioners for effecting a cure, and shall treat with most minuteness those which are now in most general use. These are, excision of the tunica vaginalis; the application of caustic; the use of a seton; and a simple incision of the sac.

By Mr Douglas it is recommended * to destroy the vaginal coat entirely; and his method of doing it is, first to dissect out an oval piece of the scrotum, which he considers as always necessary; and having then laid the vaginal coat open, to cut it away by different snips of a pair of scissars. But if there is any practitioner who still continues to prefer this excision of the sac, he will find that it may be more easily dissected away by the scalpel than with scissars, and it is rarely necessary to remove any portion of the scrotum.

The method of cure with caustic is commonly desired to be conducted in the following manner: The scrotum being shaved, a piece of common paste-caustic properly secured

* Loco citato.

secured with adhesive plaster is to be applied, of about the breadth of a finger, the whole length of the tumor; and if, on removing the caustic, it has not penetrated the tunica vaginalis, this is ordered to be done with a scalpel, so as to evacuate the contents, lay bare the testicle, and admit of proper dressings *.

But Mr Else, one of the latest writers in favours of the method by caustic, says, that there is no necessity for such an extensive application of caustic as has been recommended by authors: That an eschar of the size of a shilling answers the purpose sufficiently: That this may be always fully obtained by the application of caustic paste of the size of a sixpence; which he directs to be laid upon the anterior and under point of the scrotum, and to be properly secured by adhesive plaster in order to prevent it from spreading †.

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* Douglas on the Hydrocele, p. 3. Pott, *loc. cit.*
p. 155.

† *Vid. An Essay on the cure of the Hydrocele of the tunica vaginalis testis, 2d edition, p. 33.*

The caustic commonly produces all its effects in the space of five or six hours, and may then be removed. At this time digestives, or an emollient poultice, must be applied over the scrotum; and the whole properly suspended with a bandage.

Inflammation, we are told, is soon induced over the whole tunica vaginalis; and the febrile symptoms which succeed, are directed to be kept moderate by blood-letting, injections, &c. In a few days the eschar of the scrotum separates and comes away; and in a gradual manner, in the course of four, five, or six weeks, the whole tunica vaginalis comes off, when the wound immediately cicatrises, and a complete cure is obtained.

When the feton is to be used, the following is the method of applying it, as is recommended by Mr Pott, who has wrote a very ingenious treatise on this subject: He uses a trocar; a silver canula, five inches in length, and of such a diameter as to pass easily thro' the canula of the trocar; and a probe, six inches and a half long,
having

having at one end a fine steel trocar-point, and at the other an eye which carries a cord of coarse white sewing-silk, of such a thickness as will pass easily through the long canula. With the trocar, the inferior and anterior point of the tumor is to be pierced; and as soon as the perforator is withdrawn, and the water discharged, the seton canula is passed through that of the trocar, till it reaches the upper part of the tunica vaginalis, and can be felt in the very superior part of the scrotum. This being done, the probe armed with its seton is to be conveyed through the latter canula, the vaginal coat and teguments to be pierced by its point, and the seton to be drawn through the canula till a sufficient quantity is brought out at the upper orifice, when both the canulas are to be withdrawn, and the operation is finished.

About the end of the third day, the parts begin to inflame; when fomentations, poultices, a suspensory bandage, a temperate regimen, and a lax belly, are ordered, to keep the symptoms moderate: As soon as

the parts become easy by the inflammation lessening, which is generally about the tenth or twelfth day, the seton is begun to be diminished, when six or eight threads are withdrawn at every dressing; the dressings consisting of nothing more than a superficial pledgit upon each orifice, and a discutient cerate, such as the seratum saturninum, to cover the scrotum.

In using the seton, I should wish to follow the method here described, in every other point except in the mode of introducing it; an easier method of doing it being now discovered. In a former publication, I have described the manner of opening abscesses by a seton; and the directions then given prove equally applicable here. Let an opening be made, either with a scalpel or a lancet, in the superior part of the tumor, large enough to admit with ease a cord of white sewing-silk of a proper size. The curved director with an eye at one end*, in which the cord is inserted, is to be introduced at this opening;

and

* Delineated in the Treatise on the Theory and management of Ulcers, &c.

and its farther extremity being carried down to the most depending part of the tumor, an opening is there to be made of about half an inch or so in length, by cutting upon the end of the director with a scalpel. The director being now drawn down till a sufficient quantity of silk is left hanging out below, the operation is then finished. In every other respect the management of the seton ought to be the same with the method we have described from Mr Pott.

By making the first opening in the superior part of the tumor, the instrument conducting the seton is more easily introduced to the farther extremity of the swelling, than when the first opening is made below; for in this case the tumor remains distended to the last: Whereas, when opened below, the water runs out immediately; and the vaginal coat collapses so much about the testicle, that I have seen a good deal of difficulty in getting the instrument insinuated between them, by which I have been sensible of the testis being considerably injured.

Before entering farther into the consideration of this method of cure by the sciton, we shall proceed to describe the operation for a radical cure by incision.

The patient being placed upon a table of a convenient height, and being properly secured by two assistants, with the scrotum lying nearly upon the edge of the table, the operator with one hand should grasp the tumor so as to hold it firm and make it somewhat tense on its anterior part; and with a common round-edged scalpel in the other, he should now divide the external teguments, by one continued incision from the superior extremity of the tumor all along its anterior surface down to the most depending point of the swelling.

By this means, as the divided scrotum retracts a little, the tunica vaginalis is laid perfectly bare, for the breadth of about half an inch from one extremity to the other. An opening is now to be made with a lancet into the vaginal coat, just at its upper extremity where the first incision commenced. This opening should be of such

a size as to receive the finger of the operator; which being inserted, the probe-pointed bistoury is to be conducted upon it, and by means of it the sac is to be divided to the very bottom, all along the course of the first incision. By the previous division of the skin with the scalpel instead of the bistoury, the operation is done with much more accuracy, and with less pain; for the scalpel from its convexity admits of a much finer edge than an instrument of any other form is capable of receiving, and hence it cuts with more ease.

By making the first opening in the upper end of the sac, much trouble and inconvenience is prevented, which making the first orifice below is sure to occasion: For, as we have before remarked, when the tumor is first opened below, the water is instantly evacuated; and as this produces an immediate collapse of the tunica vaginalis, the passage through it is not afterwards easily discovered. Whereas, by making the first opening above, as the water is thereby evacuated gradually

as the excision is extended downwards, the vaginal coat continues distended to the bottom till the incision is completely finished.

We have not thought it necessary to say any thing here of the probe-pointed scissars, an instrument which some time ago was very generally employed in this operation: For wherever the knife can with propriety be used, no surgeon of these times will hesitate in preferring it.

We have directed the incision into the vaginal coat to be carried from one extremity of the tumor to the other. Many surgeons, with a view to save some pain to the patient, advise the incision both of the scrotum and tunica vaginalis to be only two-thirds of the length of the tumor. But the difference of pain thus produced is very little; being indeed nothing when compared with the uncertainty of a radical cure not being obtained by it. When the incision is carried the whole length of the tumor it is rarely found to fail; and I have known sundry instances of these partial

partial openings being followed with a return of the disease *.

The incision being completed in the manner we have directed, the testicle covered with its tunica albuginea comes into view. Sometimes the testis protrudes from the wound altogether; in which case it should be replaced with great caution, and ought by all means to be covered as quickly as possible from the external air; and provided none of the tunica vaginalis is to be removed, this may be always done immediately, by finishing the dressing directly on the sac being opened.

When the sac is not much thickened, there is no necessity for removing any part of it; but when it is discovered to be otherwise, to be thick and very hard, the removal of a portion of it on each side of the incision, makes the cure of the remaining sore more easy and expeditious. As in this hardened state the sac generally separates with great ease from the surrounding

* Mr Pott is clearly of this opinion. *Loc. cit.*
p. 163.

rounding teguments, any quantity of it may be easily taken away with the scalpel without the least danger of wounding the scrotum. Some writers indeed advise part of the scrotum itself to be cut away on every occasion*; but even in the most enlarged case of hydrocele I ever met with, no necessity ever appeared for removing any part of it.

On examining the testicle after the division of the vaginal coat, it is generally found to be of a soft texture, and of a more pale complexion than in a healthy state: On some occasions it is considerably enlarged; and on others, I have seen it reduced to a very small size, consisting of the tunica albuginea almost quite empty. As the cure of the sore however advances, the testicle in a gradual manner commonly regains its usual bulk; of this I have seen different instances, and a very remarkable case of the same kind is recorded by Douglas †.

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* *Vide* Douglas on the Hydrocele, 136.

† *Loc. cit.* p. 194, Case II.

We have hitherto supposed that the disorder is confined to one side of the scrotum; but now and then, as we have elsewhere remarked, a double hydrocele is met with. The ordinary practice in such a case is, to do the operation twice in all its parts, both in the scrotum and tunica vaginalis; to lay each collection open from top to bottom, by a double incision. Sometimes both operations are done at the same time; but in general practitioners are afraid of too much inflammation being thus induced, so that one is commonly allowed to heal before the other is attempted. In this manner the patient is exposed to delay, uncertainty, and to the hazard of two complete operations.

It may be done, however, in a much easier manner, with much less pain, and in less time, than in the ordinary method.

After finishing the operation on one side, by making an opening into the vaginal coat of the opposite testicle at its upper extremity through the *septum scroti*, and continuing the incision down to the bottom of the tumor, the cyst is thus equally well

well laid open, the water is as completely evacuated, and the patient is liable to as little hazard of a return of the disorder, as if the operation had been done in the usual manner.

From the account we gave of the anatomy of the scrotum, no danger, it is evident, can occur from any division of the septum, which we have shown to be entirely composed of cellular substance; and in fact I have twice had an opportunity of performing this operation in the manner here directed upon a double hydrocele, and in both instances with most complete success.

Whether the hydrocele be double or confined to one testicle, as soon as the water is all evacuated, and any part of the vaginal coat removed that may be necessary, the wound ought then to be dressed; and on this, it may be observed, much of the success to be expected from the operation depends.

If the vaginal coat be just wrapped about the testicle without the interposition
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of any kind of dressing, partial adhesions are apt to occur, before a degree of inflammation is produced sufficient for rendering the cure complete. By this means cavities are left, which either fill with pus during the progress of the cure, or afterwards afford an opportunity for collections of water, and thus occasion a return of the disorder; different instances of which I have met with.

And again, a desire for stuffing the cavity of the sore too much with dressings has also been a frequent cause of mischief. By their rubbing or pressing too much upon the surface of the tunica albuginea, a part which nature never intended to be much exposed, such a degree of inflammation is sometimes induced as to be productive of much pain, inflammation, and fever: But it is commonly the fault of the operator when this is the case; for in a sound healthy constitution, it seldom happens that either of the occurrences we have mentioned take place when the dressings are properly managed.

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The method I have uniformly found to succeed, is this: The testicle, if it has pushed forwards, as it sometimes does, out of the scrotum entirely, being cautiously replaced, a piece of soft lint should be inserted between it and the divided vaginal coat, first on one side of the divided sac, and then on the other, reaching from the superior part of the tumor to the most depending point of it. One end of each piece of lint ought to be left out of the sore, to fold over the edges of the wound; and the other ought to be gently pushed in between the testis and the vaginal coat, about half-way between the external incision and the bottom of the sac: If less is inserted, it does not with certainty answer the purpose; and I have commonly found that a single ply of fine lint may be introduced this length without any difficulty, and experience shows it to be sufficient. A compress of soft linen being now applied over the tumor, the whole should be properly suspended with a bandage; and for this purpose, either the T-bandage, or the common

common suspensory bag, may be employed. The patient is now to be carried to bed; an anodyne should be prescribed; and he ought to be enjoined to remain as much in the same posture as possible, for much motion in this state of the sore certainly does mischief.

The intention of this operation being to induce a moderate degree of inflammation in the parts chiefly affected, viz. the tunica vaginalis and tunica albuginea, if the pain, inflammation, and swelling, which in some degree always succeed to the operation, do not run to a great height, nothing is to be done for the first two or three days after the operation: But, when these symptoms become violent, and especially when any considerable degree of fever is induced, it must then be the business of art to prevent their going too far. The remedies to be used for this purpose, are, blood-letting, according to the strength of the patient; gentle laxatives, so as to preserve any easy state of the bowels; a low cooling diet; and warm emollient poultices

tices and fomentations to the part, in order to forward a plentiful suppuration, which commonly tends to moderate every bad symptom more effectually than any other remedy.

By these means the inflammation may in almost every instance be kept within proper bounds: From all the experience, indeed, which I have had in this disorder, I might say that it may be done in every instance; for I never yet saw any thing to the contrary, where the operation was properly performed, in a sound healthy constitution.

When, again, the pain, inflammation, and tumefaction of the parts, do not come to a great height, the cataplasms and fomentations need never be employed before the fourth day: About this time, by fomenting the parts, and applying a large emollient poultice over the whole, the external dressings are commonly easily removed about the fifth or sixth day. At this time, on taking them away, the edges of the sore are observed to be hard, and considerably swelled; and the matter discharged

charged is thin and discoloured : If the lint inserted between the testis and the vaginal coat can be easily taken out, it may at this time be removed ; but in general, it does not come away with freedom till the third or fourth dressing, when the swelling of the parts is somewhat diminished. The sore ought to be dressed once every day or two, according to the quantity of matter produced ; and the poultices should be continued till a plentiful suppuration is established.

In twelve or fourteen days from the operation, the suppuration is in general very freely formed ; and the swelling of the parts is now so much reduced as to give the whole a fine healing appearance : The only dressing necessary in this state of the sore, is a little soft lint, covered with a pledgit of any emollient ointment. The swelling of the scrotum now gradually subsides ; and the sore continuing to lessen daily, a complete cure is commonly obtained in the space of four, five, or six weeks, according to the size of the wound and other circumstances.

Having thus given an account of the manner of performing every operation at present in use for the radical cure of the hydrocele, we shall now make a few observations on the comparative advantages of the three last, viz. the caustic, seton, and the simple incision; these being almost the only means now practised for the removal of this disorder. From the testimony of many respectable authors concerning the efficacy of each of these, there is no reason to doubt, but that collections of this kind may in general be cured by any of them. That the caustic, when properly managed, will seldom fail of producing a cure, we have every reason to believe; and the same may be safely asserted both of the seton and the simple incision. But, it commonly happens, that a practitioner, from being prejudiced in favour of a particular method, continues to practise that mode and no other; and finding it in general succeed, he by degrees comes to persuade himself, that other methods of cure with which he has not had such opportunities of becoming acquainted, are liable

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to objections, which those who have practised them do not find to be the case.

I attended the hospitals in London about the time that Mr Pott's publication on the Seton, and Mr Else's Treatise on the Cure of the Hydrocele by Caustic, were published; when of course the various means of curing the disorder were frequently the subject of medical conversation. I was thereby induced to pay particular attention to the subject; and having the advantage of seeing the practice of different hospitals, and not being particularly biased in favours of any one method, I was thus furnished with an excellent opportunity of forming an opinion: And the result of all the observation I was either at that time able to make, or since that period, both in the hospital here, and in private practice, is, That although all the three modes of operating, by caustic, the seton, and simple incision, are perhaps equally capable of producing a radical cure; yet that of the three, the latter, viz. the simple incision, is liable to fewer objections, and ef-

fects a cure both with less trouble to the operator, and with less risk to the patient: and of the other two, the treatment by caustic appears to me to be the most eligible.

I have seen all the three methods produce troublesome symptoms, such as great pain and tension of the abdomen, inflammation, and fever; but from much observation, I can without hesitation say, that the seton is more frequently productive of these consequences than either of the others: And we need not wonder at this being the case; for the cord which is here introduced, lying in close contact with the body of the testis, must necessarily occasion a considerable and continued irritation, as long as it remains applied to it.

The seton is likewise attended with other inconveniences, to which neither of the others, when properly managed, are liable. When the inflammation which succeeds to the introduction of the cord runs very high, as it frequently does, it commonly terminates in such a plentiful suppuration, that the matter produced by it cannot be

readily

readily discharged at the opening made for the felon : In consequence of this, it insinuates itself into the neighbouring parts ; and different abscesses are accordingly formed, which must all be discharged by as many openings. Even when the operation has been done with much nicety and attention, I have seen it terminate in this manner.

Another objection to this operation, which I think of importance, is this : It does not admit of a free examination, either of the state of the testicle, or of the fluid contained in the sac. I know, that in a simple uncomplicated hydrocele, there is no reason whatever for examining the testicle ; nor would we think of removing it either on account of a mere enlargement or diminution of its size, provided it be not otherwise diseased. But we know well that cases do sometimes occur, which elude the utmost skill and penetration of the surgeon ; no diagnostic symptoms with which we are yet acquainted being sufficient to direct us with absolute certainty.

The most experienced practitioner must

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be sensible, that at times he has been mistaken in his opinion respecting the nature of such tumors; a real sarocele, or scirrhouſe testicle, attended with ſome effuſion of a fluid, being now and then miſtaken for a pure unmixed hydrocele; and, *vice versa*, a ſimple uncomplicated caſe of hydrocele has been frequently miſtaken for, and treated as, a scirrhouſe testicle. Such occurrences every practitioner muſt have met with: And among other writers who confeſſ their having been deceiver in ſuch caſes, a very candid acknowledgement of this kind is made by Mr Pott *; and Mr Else takes notice of a ſimilar occurrence in which he was concerned †.

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* *Treatise on the Hydrocele*, p. 288. In this caſe, which from every circumstance had been conſidered as a Sarocele, the testis, after being removed, was found to be perfectly ſound; the disease being a *real Hydrocele* of the tunica vaginalis.

There being even a *poſſibility* only of ſuch an occurrence with ſuch an attentive obſerver as Mr Pott, ought to ſerve as a moſt convincing argument with practitioners in general, of the neceſſity of proceeding with the utmoſt caution in all ſuch caſes where there is the leaſt cauſe for doubt.

† *Loc. cit.* p. 4,

I have myself been concerned in different cases, where the most experienced surgeons were at a loss to determine the real nature of the disorder; that is, whether the swelling in the scrotum was a simple hydrocele of the vaginal coat, or an effusion of a fluid into that bag produced by a scirrhouſe testicle. In all such cases where any doubt occurs, the surgeon ought to proceed as if the tumor was a real hydrocele. If, on laying open the swelling, the testicle should be found diseased, that is, if it should be in such a state as to require extirpation, it ought to be removed immediately; and on the contrary, if it should appear to be perfectly sound, the case should undoubtedly be treated altogether as a simple hydrocele.

In several instances of this kind, where, by different practitioners, a mere collection of water was expected without any other affection, the testicle has been found to be so much diseased with a real sartocele, as to render extirpation highly proper. Now, if in such circumstances

a cure had been attempted by the seton, the testicle would have been allowed to remain exposed to the irritation produced by the cord, which in all probability would have induced very troublesome and even alarming symptoms; for we know that every symptom of a scirrhouſe or cancerous tumor is uniformly rendered worse by irritation.

It has been alledged, that the real state of the testis may be always known, by drawing the water off from the tunica vaginalis by a trocar; and this has accordingly been recommended as a previous step to the introduction of the seton, with a view to ascertain the situation of the testicle. But it often happens, even after all the water is drawn off, that the thickness produced by the vaginal coat and scrotum collapsing in large folds about the testis, precludes effectually every accurate examination of this kind.

We observed above too, that when the seton is used, the contents of the vaginal coat cannot be properly ascertained. It
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frequently happens, that the water of a hydrocele is contained in a number of hydatids; a circumstance which cannot be discovered previous to the opening of the tumor: And as it will be readily admitted that the method of cure by seton is ill suited for evacuating hydatids, this of itself is a very material objection to the practice. So that, upon the whole, although the seton in every other respect should be equally eligible with the simple incision, which for the reasons formerly given I think it is not, yet the two last objections we have adduced against it are sufficient reasons for setting it entirely aside.

With respect to the mode of treatment by caustic, I have only to observe, in addition to what was already said upon this subject, that where patients are naturally timid, and do not incline to submit to the operation by the knife, this will in general be preferable.

But the treatment by caustic is liable to one very material objection, which never attends the cure by incision, viz. that of being productive of sinuses, and collections

tions of matter, in the scrotum and cellular substance connecting that bag to the tunica vaginalis. One instance of this I have seen, where it was necessary to evacuate different collections of matter by different openings; and a remarkable case of the same kind is related by Douglas, where an extensive incision was necessary for removing the collections which occurred *. For this reason, therefore, and as the mode by incision brings the state of the testicle more evidently into view; and especially as, from all the experience I have had of the two different methods of cure, that by incision seems in general to be productive of the least troublesome symptoms, I am clear that it ought to be preferred.

In different publications, we read of many dreadful symptoms induced by this operation for the hydrocele; but the same objections have been adduced against every mode of operating hitherto proposed, and the same will still be continued by such as judge

* *Loc. cit.* p. 105.

judge from partial information. In old, infirm, or diseased constitutions, this and every other mode of operating will on some occasions be productive of troublesome and perhaps fatal consequences: On the contrary, all the three methods of cure of which we have been treating, viz. those by caustic, the seton, and simple incision, will in general be found to answer the purpose very effectually, of producing a radical cure of the disorder. What I have been here endeavouring to show, and what the importance of the subject makes me again repeat, is, that this end will commonly be obtained with more ease both to the operator and patient by the simple incision than by any other means.

In a matter of this kind no person ought to form an opinion hastily. Nothing but a variety of opportunities of putting the different operations in practice, can enable any practitioner to judge with propriety of the merits of each. In the writings of the late celebrated Mr Sharpe, we have a very remarkable instance of this. In his treatise

treatise on the Operations of Surgery*, he speaks of the treatment of the hydrocele by incision as a very dangerous operation, and thinks that it will probably be discarded altogether.

At that time, it is evident, Mr Sharpe's experience in this disorder had not been sufficient for warranting such a decisive opinion. It proved to be very contrary to the direct experience of some of our best surgeons; and Mr Sharpe himself seems afterwards to be convinced that his first ideas respecting this operation had been very ill founded †.

I will not positively say, that the experience of another practitioner will not lead him to make a different conclusion respecting the success of these three modes of operating. Consequences which I have not met with, may follow each of these methods. My opinion is chiefly founded on my own observation; and as the opportunities I have had of treating this disorder,

* Tenth Edition, Chap. IX.

† *Vide Critical Inquiry*, First Edition, p. 86.

order, and of being concerned with others in the management of it, in all the variety of ways we have mentioned, have been frequent and ample, I have delivered it without reserve or difficulty.

To those who are not thoroughly acquainted with the importance of the subject, it may perhaps appear that it has been here treated with more minuteness than is necessary; but I know I will not be considered as blameable in this particular by practitioners of experience.

We now proceed to consider the third species of scrotal hydrocele, viz. that variety of the disorder in which the water is collected in the cavity of a hernial sac.

SECTION IV.

Of the Hydrocele of a Hernial Sac.

IN every species of hernia, when the parts have been long protruded, a quantity of a serous fluid collects in the bottom of the

the sac; and if any obstacle occurs to the absorption of this, if the disorder is seated in the scrotum, we can easily conceive the possibility of the tumor augmenting to such a size as to afford all the usual marks of a hydrocele: and accordingly, on consulting the various authors who have written upon hernia and hydrocele, I find a number of cases enumerated, which sufficiently warrant the insertion of this as a real, and perhaps not an unfrequent, variety of the disorder.

It was well known to the ancients, that a considerable quantity of a fluid is frequently contained in the sac of a hernia, along with the parts protruded from the abdomen; but Saviard seems to have been the first who entered into a particular consideration of this occurrence. Le Dran relates different cases of it: Heister speaks of it under the title of Hydro-entreocele: And the late Dr Monro describes it with his usual accuracy, and mentions a case of this kind where six pounds of water were evacuated from the tumor by an opening made

made with the trocar *. A case of it is also related by Douglas †, and two cases of a similar nature are mentioned by Mr Pott ‡.

The water is in this disorder confined in a cyst formed by a process of the peritonæum, and as it occupies nearly the same situation in the scrotum with the hydrocele of the tunica vaginalis, so we cannot, by the feel alone, on every occasion, mark the difference between them. For altho' the testicle in this species of hydrocele is commonly distinguished more evidently at the lower and posterior part of the swelling than in the hydrocele of the vaginal coat, yet the difference in this particular between the two diseases is not always so evident as to prove a sufficient mark of distinction.

When a portion of gut and other parts forming the hernia are down, the fulness they produce along the spermatic cord, serves in some measure to distinguish the disorder

* Monro's Works, p. 579. † Loc. cit. p. 182.

‡ Treatise on the Hydrocele, p. 21.

disorder from a simple hydrocele. And when, along with this and other symptoms of hernia, we evidently discover in the tumor of the scrotum a fluctuation of a fluid, if this fluid can by pressure be made to disappear either entirely or in part, the nature of the disorder is thus rendered obvious.

This species of hydrocele may occur as readily in the hernia congenita as in any other variety of rupture, and in that event, the water must for certain be contained in the same sac both with the testicle and protruded intestines. Indeed, as all the fluid naturally secreted for keeping the surface of the different abdominal viscera moist, must in the case of a congenital rupture fall into the hernial sac, we would be induced to suppose that almost every case of this kind of hernia ought to be complicated with the disorder we are now describing. The two cases of this species of hydrocele related by Mr Pott, we find to have been connected with a hernia congenita; and I have myself seen two instances

stances of the same kind. But whether this commonly happens or not, farther observation will discover.

Whatever species of hernia this kind of hydrocele may be connected with, if the water can by pressure be made to pass into the abdomen, this will always prove a certain characteristic of the disease; for in no other species of encysted hydrocele is it possible to make the water disappear by pressure. It may happen, however, in this kind of hydrocele, that this distinguishing symptom of the disease does not exist; for if by the pressure of a truss, or from any other cause, an adhesion is produced in the groin between the sides of the hernial sac, if the under part of the sac continues open with water collected in it, the tumor which it occasions will afford all the usual appearances of a hydrocele, while no part of its contents can be made to pass into the abdomen by pressure: A case of this kind we find related by Le Dran, where the neck of the hernial sac

was shut completely, and a hydrocele formed in the under part of it.

In such a case, the only means of distinction will be, an acquaintance with the previous history of the disorder. Whenever in an ambiguous case of this kind it is found, that, before the water began to collect in the scrotum, the patient had been liable to a hernia of the same side, this circumstance alone will tend much to determine the nature of the disease. But even although a mistake should occur here, and although this species of hydrocele should be considered by a practitioner as a simple hydrocele of the tunica vaginalis, nothing bad could ensue from it; for the treatment adapted to one species of the disease, would apply with nearly equal propriety to the other.

But when the protruded parts still remain down, unless the operation for the bubonocele is at the same time submitted to, no other operation should be attempted than that of discharging the water by a puncture with a small trocar, when the size

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of the tumor renders such a step necessary. For unless it was intended to perform the operation for the hernia at the same time, much mischief might ensue from exposing the bowels to the external air, by laying the tumor open for a radical cure of the hydrocele.

Whenever in this species of hydrocele it is resolved to have recourse to the radical cure, the simple incision ought unquestionably to be employed; as from the risk of injuring the bowels or other parts protruded from the abdomen, neither the seton nor caustic are here admissible. Indeed this consideration of itself affords a very strong argument in favour of the method of treating the hydrocele in every instance by incision, which lays all the parts concerned in the disorder open to view: The very possibility of a patient being killed by a seton passing through a portion of intestine contained in a hydrocele, is a weighty objection against the seton being ever used; and every practitioner must acknowledge, that when the spermatic process along the

groin is much distended, and when the vaginal coat of the testis is much thickened, such uncertainty often occurs as to render it impossible for the most skilful surgeons to determine with precision what the contents of such swellings really are. In the two instances above alluded to, of a hydrocele connected with a congenital hernia, and which I met with some years ago, there had not been previously in either of them any cause to suspect the real nature of the case. They were both by skilful practitioners taken to be collections of water in the tunica vaginalis, without any complication whatever; and in each of them, on the tumor being laid open, together with water in contact with the testicle, a piece of intestine was found protruded into the upper part of the scrotum: In one of the cases, too, a small portion of omentum accompanied the gut.

In this last, it was proposed, at a consultation of different surgeons, to employ the seton. For some reason or other, this was fortunately rejected; for, on laying the tumor

tumor open by incision it evidently appeared, that if a cord had been introduced, it must in all probability have passed thro' the protruded gut. The mere possibility, therefore, of such an occurrence, I would consider as a very material objection to the method of treating any case of encysted hydrocele by the feton.

SECTION V.

Of the Anasarcaous Hydrocele of the Spermatic Cord.

IN the anatomical description we gave of these parts, it was observed, that, soon after the descent of the testis, the passage along the spermatic process of the peritonæum is completely obliterated, by the sides of the passage adhering to one another through the intervention of cellular substance.

By external pressure, and perhaps from other causes, this adhesion of the sides of the peritonæal process in general is very firm in that part of it which passes along

the groin; but the superior and more internal part of the process, is not only more loose in itself, but is connected with and enveloped in a very loose cellular substance.

From this cellular structure of these parts we might *à priori* suppose them to be liable to œdematos swellings, which other parts of the body of a similar structure are frequently attacked with: And accordingly, we find this process of the peritonæum liable to partake of every anaëmous swelling with which the rest of the body is attacked: it sometimes accompanies ascites; and it now and then appears as a local disorder, without being combined with either of these.

The causes of this disorder in general are, obstructions produced in the lymphatics of the part, by scirrhous affections of the liver, spleen, and other abdominal viscera: I have likewise known it induced by the pressure of a truss applied for the cure of a hernia*.

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* An instance of this kind is also mentioned by Douglas, *Treatise on the Hydrocele.*

When a swelling of this kind is connected with a general anasarcaous affection, the nature of the disorder is so distinctly marked as to render a particular description of it unnecessary. When it occurs as a local disease its appearances are these: A colourless tumor in the course of the spermatic cord; soft and inelastic to the feel, and not attended with fluctuation. In an erect posture, it is of an oblong figure; but in a recumbent posture of the body, it becomes more flat, and somewhat round. It does not commonly occupy more than the usual stretch of the cord along the groin; but on some occasions, it extends down the length of the testicle, and even stretches the scrotum to an enormous size*. By pressure the swelling can be always made to recede, if not entirely, at least in great part, into the cavity of the abdomen; but it instantly returns to oc-

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* A remarkable instance of this is related by Mr Pott, who from a swelling of this kind discharged eleven English pints at once. *Treatise on the Hydrocele*, Case X.

cupy its former situation on the pressure being withdrawn.

When a tumor of this kind depends upon a general anasarcaous swelling of the body, unless the cause which gave rise to the original disease of the constitution be removed, it would be a vain attempt to endeavour to cure this particular symptom; and it commonly happens, that these swellings in the groin which occur in the anasarca, disappear when the disease of the system at large is carried off.

But when a swelling of this nature occurs as an original disorder, produced perhaps by some local cause, a local remedy is then the only means necessary to be employed. In such a case, as we have not the general bad habit of body to encounter, which commonly occurs in cases of scrotal anasarca, we need not be so much afraid of making a free large incision into the tumor; and accordingly all that is necessary to be done here, is this: As soon as the swelling has acquired such a size as to become inconvenient, an incision should be made

made with a scalpel from one end of it to the other, taking care to go so deep as effectually to evacuate all the water contained in the cells of the part; and as the water is now and then found to have acquired a viscid consistence, this circumstance renders a deep incision more necessary than it otherwise would be.

The contents of the swelling being all removed, some soft lint should be inserted between the lips of the sore, which must afterwards be treated in every respect as a simple wound from any other cause; by poultices and fomentations, if much pain and a scanty suppuration render these remedies necessary; and by a due attention to dressing so as to induce the formation of firm granulations from the bottom.

S E C T I O N VI.

Of the Encysted Hydrocele of the Spermatic Cord.

THE surrounding substance of the spermatic cord being altogether cellular,
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the formation of encysted tumors, we may conclude, ought here to be as frequent as in other parts of the body; and accordingly we find in some instances, that water, instead of diffusing itself over the whole spermatic process, is collected in one or more distinct cells or cysts.

This kind of hydrocele being on its first appearance very small, gives little or no trouble, and is therefore seldom much noticed till it has acquired a larger size. On some occasions, the swelling begins in the superior part of the process; but in general, it is first observed towards its lower extremity a little above the epididymis. By degrees, however, it stretches upwards, and on some occasions so far downwards as to reach from the abdominal muscles to the very bottom of the scrotum; in which case, a person not versant in disorders of this nature, may very probably mistake this species of hydrocele for a collection in the tunica vaginalis testis: But we have here a very characteristic distinction between the two diseases. In the commencement

mencement of this species of swelling, the tumor is always above the testicle, which is distinctly felt below it; and even in the most advanced stages of the disorder, the testis is found lying at the back part of it, perfectly unconnected with the swelling: Whereas, in the advanced state of a hydrocele of the tunica vaginalis, although some degree of hardness is always discovered at that part where the vaginal coat adheres to the testicle; yet in the latter period of that disorder, when the swelling is considerable, the testis itself can never be distinctly felt. In the species of hydrocele we are now describing, the figure and size of the penis is not commonly so much altered, as when the water is collected in the tunica vaginalis, when the penis is frequently made to disappear almost entirely.

In other particulars, the encysted dropsy of the spermatic cord is very similar to the hydrocele of the tunica vaginalis testis. A fluctuation of a fluid is evidently discovered

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ed on pressure: The tumor is commonly of a pyramidal form, as is generally too the case with the other, with its base or largest extremity downwards*: And no pressure has any influence in making it disappear either altogether or in part.

This is the appearance of the disorder when the water is contained in one cyst; when it is separated into two distinct cells, the line of division is commonly evident, by the tumor being at that part somewhat puckered, or sometimes a little diminished in its diameter. A similar appearance, we may observe too, takes place when this species of swelling is combined with a real hydrocele of the tunica vaginalis testis, which on some occasions it is: And in that case, a line of separation is observed at

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* A Hydrocele of the tunica vaginalis testis is so frequently of a pyramidal form, with its base downwards, that this shape may be considered as one of the characteristic appearances of the disease; every other tumor to which the testis and its coats are liable, being either more round, or of a more irregular shape.

that part where the upper extremity of the tunica vaginalis terminates.

We have already mentioned the means of distinction between this species of hydrocele and that of the vaginal coat of the testis. The only other affections with which it is in danger of being confounded, are the anasarcaous hydrocele of the spermatic cord; and a real hernia, either of the omentum, or of a portion of gut. From the former, however, as also from an omental hernia, it may in general be distinguished by the feel. In neither of these can the fluctuation of a fluid be in the least perceived, and to the touch they are both soft and inelastic; whereas, in this species of hydrocele, the tumor has a springy kind of feel, and a fluctuation is evidently found in it. And in both the others, the swelling recedes more or less upon pressure, which it never does in this species of encysted hydrocele.

From a gut-rupture it is chiefly distinguished by the tumor beginning not at the ring in the external oblique muscle, as is the case in hernia, but farther down the cord:

cord : In the latter too, the swelling commonly turns less on the patient getting into a horizontal posture ; and it is always considerably affected both by coughing and sneezing ; but no posture, no pressure, nor any accident whatever, alters the size of this variety of hydrocele. The absence of other symptoms of hernia, too, is here material in the distinction : For there is neither pain in the tumor, nor in the abdomen ; nor sickness, vomiting, nor any interruption to the passage by stool, as there very commonly are in hernia.

Although all the ancient writers were quite unacquainted with the anatomy of the parts concerned in this disorder, it is evident they were well aware of its existence. We find it particularly described by Ægineta, Albucasis, and afterwards by Fallopius, Wiseman, &c. Arnaud, in his treatise on hernia, also takes notice of it, tho' not with much accuracy ; and we find it more lately described with exactness, by the late Dr Monro, by Douglas, and by Mr Pott.

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This species of hydrocele, as also the ana-sarcous swelling of the cord, and the œdematous tumor of the scrotum, are all very frequent in infancy. In that tender age, however, they generally soon dissipate, and in this they are much assisted by the application of cloths dipped in spirit of wine; and I have seen much advantage produced by an application of a strong infusion of red-rose leaves, combined with a considerable proportion of alum. The late Doctor Monro advises the application of cloths warmed with the fumes of burning benzoin.

But in adults, the cyst confining the water generally becomes so firm as not to be affected by any of these remedies. So that when it arrives at any considerable size, which it frequently does, either the means for the palliative or radical cure may be employed, as was recommended in the hydrocele of the tunica vaginalis testis.

When it is intended merely to evacuate the water by puncture, it ought to be done with a trocar, in the same manner as was directed for a hydrocele of the tunica vaginalis;

ginalis; taking care to introduce the instrument at the most depending part of the tumor. And again, when it is intended to effect a radical cure, the same means are to be employed which we formerly recommended in the other species of the disease. There do not here, indeed, occur the same objections to the use of the seton, as in the hydrocele of the tunica vaginalis from the presence of the testicle: And if we could in every species of hydrocele ascertain with certainty the exact contents of the tumor, the seton might no doubt be employed here with safety and advantage: But as it is clear from what we have already said upon this point, that no certainty of this kind can be obtained; and as a hydrocele of a hernial sac in which a portion of gut is contained, may be as readily confounded with this as with any other species of the disease; I would therefore without hesitation lay this method of cure entirely aside.

A material objection occurs to the method of cure by Caustic in this species of hydrocele,

hydrocele, which is not applicable in the hydrocele of the tunica vaginalis, viz. the water being in some instances of this disorder collected in two or more distinct cysts; different cases of which I have met with, and similar occurrences are related both by Garengeot and Douglas.—Now in such an event, if caustic should be applied in the method recommended by Mr Else, upon a small spot only, all the water would not be evacuated; and in order to obtain a complete removal of the disorder, it would be necessary to repeat the application of the caustic.

This, I think, is an additional reason for employing in all such instances the method of cure by incision; which by laying the tumor open from one end to the other, divides at once all the different cysts of which it may be composed, and saves the patient from that distress and disappointment which must always be experienced, on a complete cure not being obtained when good reasons had been previously given for expecting it. We would therefore advise

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the treatment by incision in this species of hydrocele, in the same manner as was recommended in the hydrocele of the tunica vaginalis; the mode of performing the operation, and the after-treatment of the patient, being nearly the same in each.

We have thus enumerated all the kinds of hydrocele which can properly be considered as forming distinct varieties of the disorder. In doing so, as no disease is described but such as every practitioner of experience must have met with, and of which the symptoms are clearly and distinctly marked; so it will not, I hope, be considered as an unnecessary degree of minuteness that I have particularly taken notice of them all.

I can by no means agree with some authors, particularly with Mr Sharpe * and Mr Else †, who think it might be better to confine the description of this disorder to two species. We need not indeed wonder at Mr Sharpe speaking in this manner: For even at the late period in which he wrote,
although

* Treatise on the Operations of Surgery.

† Loco citato.

although the existence of all the varieties of the disease we have mentioned had been described by different authors, yet they were not till of late years understood with much accuracy; and it is very evident from Mr Sharpe's writings on this subject, that his ideas of these disorders were in many respects more confused than could have been expected in one of his usual accuracy and penetration. But whatever was the case with Mr Sharpe, it is truly surprising, that those who are unquestionably well informed in every circumstance relating to this disorder, and who must be convinced, from their acquaintance with dissection, of the existence of all the varieties of the disease that have been mentioned, should object to their being retained. Where no evident or marked distinction occurs between one tumor and another, an attempt to establish a difference would be useless, and therefore improper; but where appearances point out an obvious variety, it would surely be considered as an unpardonable ne-

gleet in an author to omit the detail of them.

In our description of the five different species of hydrocele, viz. the anasarcaous swelling of the scrotum ; the hydrocele of the tunica vaginalis testis ; the hydrocele of the hernial sac ; the anasarcaous swelling of the spermatic cord ; and the encysted collection in that part ; it was necessary, in going along, to enumerate the symptoms of each as they occur separately and uncombined. It sometimes happens, however, that one, two, or more of the different species occur at the same time in the same patient : On some occasions I have met with three, and not unfrequently with two, varieties in the same person : The late Dr Monro mentions an instance of four species of hydrocele being all combined in one case *.

In such occurrences some difficulty and confusion is, no doubt, to be expected ; but practitioners in forming a judgment of their nature, must be entirely directed by

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* See his works, p. 576.

a due attention to the various symptoms which usually occur in a separate state in each variety of the disease.

We now proceed to the consideration of the other varieties of false hernia; and first of the Hæmatocèle.

C H A P. VII.

Of the Hæmatocèle.

THE Hæmatocèle is a tumor in the scrotum or spermatic cord, produced by extravasated blood.

The usual seat of such tumors is in the tunica vaginalis of the testis; but on some occasions they are seated in the spermatic process, and now and then they are met with in the dartos.

Tumors of this kind are in general pro-
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duced by the rupture of one or more blood-vessels, in consequence of external violence. Blows upon the scrotum have produced ruptures of veins, not only in the cellular substance of the scrotum, but in the vaginal coat of the testicle; and accidents of a similar nature have produced similar affections in the course of the spermatic cord; and as the parts in this situation are very lax and cellular, the rupture either of an artery, or of a vein of any considerable size, will always be attended with a plentiful extravasation of their contents.

In the tunica vaginalis testis, this disorder is frequently induced by the point of a trocar or of a lancet in tapping for a hydrocele, wounding some of the blood-vessels of the sac, which in such cases are always much enlarged. In such an occurrence, we are commonly rendered certain of what has happened, by the water drawn off being suddenly tinged with blood; but on other occasions it does not appear till the water is all evacuated, and then a tumor
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of a considerable size is frequently produced in the course of a very short space of time.

In some of these cases where the bulk of water has been remarkable, the sudden discharge of it, by taking away the support which the vessels of the part have been for some time accustomed to receive from it, has undoubtedly been the cause of the rupture of some of them; and from repeated observation I think it may be considered as a certainty, whenever a tumor is produced either in the scrotum or spermatic cord, suddenly after the water of a hydrocele has been evacuated by tapping, that it is entirely the consequence of an extravasation of blood; for collections of water are never known to arrive so quickly at a considerable size.

In the spermatic process, injuries of the same kind will be attended with a similar effect upon the smaller veins of the sac containing the water; and more considerable violence has on some occasions pro-

duced a rupture of the spermatic artery and vein.

But, in whatever way the tumor has been produced, the appearances are nearly similar to those of watery collections in the same parts, so that we do not consider it as necessary to repeat them here: Only it may be observed, that when blood is extravasated in the scrotum, it is easily discovered from a collection of water by the colour, it being in every respect a real Ecchymosis. When the swelling is seated in the tunica vaginalis, the means of distinguishing between blood and water, is, that a tumor produced by the former, feels to be more heavy than water in proportion to its bulk; and they who are much accustomed to handle such disorders, are on many occasions sensible of a difference of consistence.

The treatment here is nearly the same that we have already recommended in cases of hydrocele. In the commencement of the anasarcaous or diffused species of hæmatocele, when produced by a slight external violence, whether in the scrotum or spermatic

tic process, the application of ardent spirits, or of a solution of alum, will on some occasions effect its discussion: But when this, upon trial, is not found to succeed, the tumor is to be laid open, and in every respect treated in the same manner as was directed for the hydrocele; only, if a ruptured blood-vessel is discovered, the only effectual means of preventing a return of the disorder is to secure it by ligature.

In the same manner, all collections of blood, either in the vaginal coat of the testis, or in the cyst of a former hydrocele of the spermatic cord, are to be laid open by an incision extending the whole length of the tumor, and are to be treated as we formerly directed for hydrocele. And, as we have already advised in the diffused species of hæmatocele, if any ruptured vessel comes into view in the course of the operation, it ought to be immediately secured by ligature. It sometimes happens, however, in affections of this kind, both of the spermatic process and tunica vaginalis testis, that the vessels from whence the blood

blood is discharged cannot be detected; a very considerable oozing continuing from day to day, notwithstanding the use of bark, vitriolic acid, and every other means commonly employed in such cases.

If, after a proper trial of all the ordinary remedies used in cases of hæmorrhagies, the vessels from whence the blood is discharged cannot be otherwise secured, the end in view may frequently be obtained by extirpation of the testicle; which, in such occurrences, is the only remedy from which any advantage is to be expected.

Another species of hæmatocele is taken notice of by Mr Pott, in which the blood is contained within the tunica albuginea of the testis. It proceeds, he thinks, from a relaxation or dissolution of part of the vascular structure of the testicle; and when the quantity of blood collected is considerable, it produces, Mr Pott remarks, a fluctuation somewhat like to that of an hydrocele of the tunica vaginalis.

When this happens to be mistaken for

a hydrocele, as it has sometimes been, and an opening with a trocar is made into it, a discharge is produced, of a dark dusky-coloured blood, nearly of the consistence of thin chocolate; but although some diminution may be made in the size of the tumor, by the evacuation thus obtained, yet no considerable alteration is effected by it.

Any perforation that is made into it, accordingly does no good; and as the testicle is commonly so far spoiled by the disease as to be rendered quite useless, castration is advised as the only effectual remedy *.

I have different times met with a disease very similar to this described by Mr Pott: But as the blood in such instances did not appear to be extravasated, but to be still contained in the vessels of the testis in an enlarged varicose state, I would not incline, therefore, to refer this kind of tumor to any species of hæmatocele. I have even seen this disorder mistaken for a hydrocele, and treated as such, by a trocar being plunged

* Mr Pott's Treatise on the Hydrocele.

plunged into it, when the effects were just such as are described by Mr Pott. But, if the blood had been extravasated, a more copious discharge ought to have taken place, in consequence of the operation, than was procured by it in any of the cases I have met with : Even where the tumor has been of a considerable size, I never found it possible to evacuate in this manner more than a spoonful or two of blood; and although in such cases the blood appears evidently to be thicker than it ought to be, yet it is by no means so much so as should prevent it from being freely discharged by the canula of a trocar if it was lodged in a state of extravasation. But in all the instances I have ever seen of this disorder, the blood appeared to be still contained within its proper vessels in an enlarged varicose state; so that, instead of considering such a tumor as a variety of hæmatocele, I would rather refer it to a species of Varix.

In any cases of this kind that have occurred to me, when the tumors were not opened, but were entirely trusted to the

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support afforded by a suspensory, they have in some instances remained for many years without being productive of any mischief: And they are commonly attended with this peculiarity, that when effectually supported by a bandage, they remain stationary for a great length of time, without acquiring any additional size; a circumstance which no support will prevent either in a hydrocele or in the real hæmatocèle. But as soon as the tumor, by being mistaken for a hydrocele, is touched with an instrument with a view to evacuate its contents, it is from that moment sure to go wrong. The patient, from being previously liable to little or no pain, immediately on the tumor being opened becomes very much distressed; the swelling then begins to increase, and in a gradual manner to prove so troublesome by frequent discharges of blood, as to render castration absolutely necessary.

Even this disagreeable resource does not always prove a certain relief; for it sometimes happens, that such a spongy relaxed

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state of the vessels occurs along the whole course of the cord, that although they are secured by ligature to-day, the blood bursts out from different parts of the sore to-morrow. I happened once to be concerned in a very melancholy instance of this kind: After the usual operation of castration, fresh hæmorrhagies occurred at every dressing; the vessels were at different times secured by ligature, but to no purpose; the blood burst out again and again; and the patient, after suffering much distress, at last died.

The only difference which, before laying the parts open, can be observed between this species of tumor and a real hydrocele of the tunica vaginalis, is, that in this, the fluctuation in the swelling is never so evident as in the other; the tumor is heavy in proportion to its size; and if properly supported by a bandage, it does not receive any additional increase. Whenever these circumstances, therefore, occur in the same case, it ought to afford much reason to suspect that the swelling is of this nature,
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and that accordingly it ought not to be meddled with.

As I consider this disorder to be entirely of the varicose kind, I would not have thought of introducing the consideration of it here; but as it was proper to mention its having been taken notice of by others as a species of hæmatocele, I thought it better to finish the discussion of it at once, than to be under the necessity of bringing it in again in a subsequent chapter.

C H A P. VIII.

Of the VARICOCELE, CIRSOCELE, SPERMATOCELE, and PNEUMATOCELE.

BY the first of these terms is meant, a varicose distention of the veins of the scrotum; which in this state form a tumor

tumor of hard knotty inequalities, seldom attended with pain, and in general productive of no inconvenience except what arises from its bulk.

The Cirfocele is a tumor of a nature similar to the former; in the course of the spermatic cord, extending from the superior part of the scrotum to the abdominal muscles, and produced by a varicose distention of the spermatic vein.

Both these affections are now and then produced, by obstruction of one kind or another in the veins of these parts; but most frequently they depend on a debilitated relaxed state of the veins.

When tumors in the course of the veins are detected as the cause of such swellings, or when the pressure of a hernial truss upon the spermatic process is discovered to be their origin; the removal of this evident cause of the disease ought to be the first attempt towards a cure.

If the pressure of a truss has been the cause of the swelling, an alteration in the bandage may probably remove it. If

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tumors of a hard scirrhouſe nature have produced it, their extirpation, when that is found to be practicable, will be the most effectual means that can be employed; and if the tumors have any tendency to suppurate, warm emollient applications will be more useful than any other remedy.

But when a general relaxed state of the veins is suspected to give rise to the complaint, such remedies ought to be employed as will most effectually recover that tone, of which they have been deprived by being long over-distended. For this purpose nothing commonly answers so well as the use of a proper suspensory bandage; a horizontal posture; the cold bath; and the application of a solution of alum and other astringents, to the parts affected.

By a due continuation of these means every affection of this kind may be always prevented from increasing, and will commonly be so far relieved as to render the harsh means by the knife, the cautery, and ligature, recommended by ancient writers for the removal of such tumors, unnecessary.

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By

By the term Spermatocele, is meant, a morbid distention of the epididymis and *vas deferens*, produced by a stagnation of semen. This may be produced by tumors, stricture, or inflammation, about the *caput gallinaginis*, or in the course of the *vas deferens*; but there is reason to think, that it is more frequently induced by the last, viz. by inflammation, than by either of the other two.

When an inflammatory affection of the parts is discovered to be the cause of the disease, general and topical blood-letting, gentle laxatives, a low cooling diet, and rest of body, will commonly be found the most effectual remedies. And again, when tumors are discovered to press upon the *vas deferens*, they ought either to be brought to suppurate, or their extirpation should be attempted when that can be done with propriety. At other times, these tumors are found to depend on a venereal cause; and in such instances a well-directed course of mercury has been known to remove them.

On some occasions we are told, that all
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the other means having failed, castration has at last been found requisite. This, however, we cannot suppose to be ever a very necessary measure.

The term Pneumatocele, is applied to signify a distension of the scrotum by a collection of air.

This has been described by most of the ancient writers as a very frequent occurrence; but there is much reason to think, that a great proportion of all the tumors they take notice of as containing air, were either formed by collections of water, or by a protrusion of some of the bowels. That species of hernia to which young children are liable, is to this day by our common people termed a Wind Rupture; as are all those collections of water in the scrotum with which new-born infants are affected: But we know well, that none of these tumors are formed merely by wind; their contents being of a very different nature.

In wounds of the lungs, air is sometimes thrown into the surrounding cellular sub-

I i 2 stance,

stance, and in that way passes into the scrotum, as it does in particular instances over the whole body; and in high degrees of putrid diseases, so much air may be separated from the blood, as to distend the cellular substance of the scrotum, as well as of other parts: But a real pneumatocele has never, probably, existed as a mere local affection of the scrotum; at least I have never seen it.

In the case of air diffused into the cellular substance of these parts, in consequence of a wound or any other affection of the lungs producing an extravasation of it, the same method of cure will answer for its removal that we recommended for anasarcaous swellings formed by water, viz. small punctures with the point of a lancet, which are found to be fully sufficient for evacuating great quantities of air. But whenever the disease is induced by such a great degree of putrefcency in the system as is necessary for effecting a separation of air from the blood, there can be little reason to expect any advantage to result from whatever means may be employed for relief.

C H A P.

C H A P. IX.

Of the SARCOCELE, or SCIRRHOUS TESTICLE.

BY the term Sarcocele, is understood, a firm fleshy kind of enlargement of the testicle: A simple inflammatory affection of the testis affords a tumor of some degree of firmness; but the true farcocele, or scirrhous testicle, is attended with a hardness never to be met with in the real hernia humoralis or inflamed testicle.

A scirrhous testicle, in the course of its progress, puts on such a variety of appearances, as renders it difficult by description to give an adequate idea of it: In general, however, the accession and progress of the disease is as follows.

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An unusual degree of hardness, attended with a trifling enlargement of the whole testis, proves in general to be the first indication of the disease: In the beginning, no discolouration is observed, nor is there any material pain: In a gradual manner the tumor acquires a larger size: As yet it remains smooth and equal on its surface; but with the size of the swelling, the hardness also becomes more remarkable: Slight pains are at times felt through the substance of the tumor; and if it be not suspended, the patient complains of some uneasiness in his back.

When there is nothing particularly bad in the constitution, the disorder will on some occasions remain in this situation for a great length of time; and in a few instances, by a moderate diet, keeping an open belly, suspending the tumor properly, and avoiding violent exercise, the disorder has not only been prevented from increasing, but has in a gradual manner dissipated: Such favourable occurrences, however, it must be owned, are exceedingly

ingly rare; for the swelling, instead of discussing, or remaining stationary, in general proceeds with more or less rapidity to turn worse. The tumor acquires a larger size; becomes ragged and unequal on its surface; and the pain, which at first was trifling, becomes more severe, darting, in smart stings, through the substance of the tumor.

The inequalities on the surface of the tumor by degrees increase, and continue to retain the same kind of hardness with the swelling from which they originate: On some occasions, a considerable quantity of serum is extravasated into the *tunica vaginalis*, which, to those not acquainted with the nature of such disorders, gives the tumor the appearance of a common hydrocele: And at other times, instead of such depositions into the vaginal coat, partial collections of matter are formed through the whole body of the tumor: These by degrees increase; and the scrotum, which has hitherto been gradually distending, at last bursts, and a discharge takes place

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from the various collections in the body of the tumor, of a thin, fetid, bloody matter.

On some occasions, the spermatic cord becomes hard and enlarged soon after the commencement of the disease; but in general the cord does not become affected till the tumor has acquired a considerable size, and most frequently, I have observed, not till matter has formed in some part or other of the swelling.

As the disorder of the testicle advances, this affection of the cord also becomes worse: From being at first only slightly tumefied, it gradually turns more hard and swelled; it becomes very painful, and knotty or unequal through the whole extent of it.

The discharge from the openings in the scrotum still continues: But although the matter increases in quantity, the size of the tumor is not thereby diminished; on the contrary, it still continues to increase: The edges of the sore become hard, livid, and retorted; and fungous excrescences push out from different parts of it.

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Whatever was the state of the patient's constitution on the first attack of the disease, in this advanced state of it, it is always greatly impaired: He now becomes emaciated; of a pale, wan complexion; and the disorder, which in this stage of it is a real cancer of the most malignant nature, turning still more virulent, by the pain becoming more tormenting, the patient is at last carried off in very great misery.

Such, in general, is the progress and event of this dreadful disorder, if it be not interrupted by extirpation of the testicle before the swelling has proceeded too far. We have already said that it exhibits a great variety of symptoms: Those here enumerated occur most frequently; but no description can convey a clear idea of all the appearances it assumes. On some occasions, we have already observed, it remains apparently in an indolent, inactive state, for a great length of time, even for years; and in others, it proceeds so rapidly, that in the space of a few months it has

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been known to pass through all the various changes we have enumerated.

In by much the greatest proportion of such affections the disorder begins in the body of the testis, affecting the whole of it equally; but now and then it makes its first appearance in the epididymis, and sometimes even in the spermatic cord. It has been a prevailing opinion, indeed, that a scirrhouss hardness tending to cancer, never does begin in the epididymis; but that the testicle is always first affected. This is certainly the case in general; but every practitioner must at times have met with cases of a real cancerous nature, beginning in the epididymis, and sometimes even in the spermatic cord, and spreading from thence to the neighbouring parts.—I might here insert different cases of this nature, which have fallen within my own observation; but Mr Pott's collection furnishes a sufficient number of well-marked examples of the fact*.

In almost every case of swelled testicle
from

* Treatise on the Hydrocele, Cases 42. 48. and 49.

from a gonorrhœa, the epididymis is not only affected before the testicle, by the inflammation in such cases spreading from the urethra along the vas deferens, when of course it must first reach the epididymis; but the disorder in such cases, when it begins to yield, always first removes from the testicle, leaving in general a scirrhouſe hardness in the epididymis, which on some occasions in the course of time dissipates entirely, and in others remains of the same degree of hardness for a considerable time, and now and then even for life. But as the hardness produced in this manner is merely the consequence of inflammation upon a membranous or vascular part; so here, as in other parts of the body of a similar texture, we seldom find, that hardness thus induced terminates in any thing bad.

The contrary, however, of this has been too much inculcated. It has been said, that the hernia humoralis produced by a venereal infection, is a frequent cause of the worst kind of scirrhouſe testicle; which, as the fact is very much otherwise, has this
improper

improper tendency, that it prevents the use of, and a proper perseverance in, such courses of medicine, as might, without the necessity of extirpation, have removed it: There have even been instances of this idea being so improperly applied, as to be the means of different testes being extirpated, which were evidently diseased from a venereal cause, and which by proper courses of mercury might in all probability have been removed.

But although I have said that affections of this nature, I mean a swelling of the testis from a venereal cause, are very seldom known to end in any thing bad; yet I will not go so far as to say that they never do so: For I know, that a hardened state of the testis and epididymis, produced originally by a venereal taint, does in some instances degenerate into the worst species of sarcocel; that is, that though affections of this kind do most frequently terminate easily, yet that now and then in particular constitutions, whose peculiarities, however, we are not acquainted with, they do certainly produce

produce scirrhosities of the very worst kind, when such ailments would never probably have appeared if the original venereal taint had not occurred as an exciting cause of the disorder. We know well, that a predisposition to different disorders will remain long in a latent state in the system, without being productive of any evident affection, till the application of some particular stimulus brings it into action: In the same manner, a venereal inflammatory affection of the testis, will in some constitutions terminate in much mischief, altho' in general its effects in this way are by no means to be dreaded.

I have dwelt longer upon this point than I otherwise should have done, from a contrary doctrine having been strenuously inculcated by one whose authority is deservedly great, and whose observation in this disease has led to the conclusion he endeavours to establish*: But as all the experience I have had in these matters, has led me to form the opinion here delivered,

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* Mr Pott, *Treatise on the Hydrocele, &c.* p. 232.

I could not avoid stating it in the manner I have done.

In the treatise alluded to, we are told, that a hernia humoralis is never, in any one instance, productive of this disease. If on this subject Mr Pott's idea is just, it ought undoubtedly to be received: But if it is not, it may very certainly do mischief, by rendering both patients and practitioners more remiss in cases of farocele proceeding from this cause than they otherwise would be; as, by continuing still in hopes of a mercurial course being able to effect a cure, they may thereby allow the disease to go too far even for extirpation to be adviseable.

In every doubtful case of this kind, when a venereal infection is suspected as the cause of the disease, blood-letting when the pulse is full; an open belly; a cooling diet; a horizontal posture; with a proper suspensory bandage; and a well-directed mercurial course, will very commonly remove it. But when
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in such instances the means recommended are put in practice without any evident advantage; and especially if, during their application, the disorder, instead of mending, turns gradually worse; as soon as from its increase in size there appears to be any risk of its advancing beyond the reach of operation, it ought then at all events to be extirpated, whatever the cause which originally produced it may have been.

Among other causes mentioned by authors as being productive of a scirrhouſe state of the testicles, is the hydrocele of the tunica vaginalis. From quantities of a watery fluid being frequently found in the vaginal coat of a scirrhouſe testicle, it has been supposed, that the water in such cases was the original cause of the disease in the testis, and not the consequence of it. There is every reason, however, to think, that in these collections of water in the vaginal coat, in which the testis is found diseased, that the hardened state of that organ ought to be considered as the original disorder,
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and not the quantity of water which surrounds it.

Collections of water are no doubt often met with, even in the real sarcocele; but this ought to be considered only as a different stage of the same disease: For altho' the true scirrhouſe testicle is never at first attended with any collection of this nature, it is natural to suppose, that a hard diseased state of that viscus must have some influence in producing an alteration in the quantity of fluid with which the tunica vaginalis is always provided in a sound healthy state. If it either produces an augmented secretion, or a diminished absorption of that fluid, a dropſical swelling must be the certain conſequence; and every ſuch collection, combined with a scirrhouſe testicle, has been very properly termed a *hydro-sarcocele*.

That the testis, by remaining long im- mersed in the water even of a true hydro- cele, does frequently become ſomewhat altered in its texture, there is no reaſon to doubt,

doubt. Thus, as we have elsewhere observed, on laying open the tunica vaginalis, the testis in that disorder is always found to be of a more pale appearance than it naturally ought to be: On some occasions it is very much diminished, and on others considerably enlarged; but all such enlargements, when connected with a real hydrocele, are of a soft harmless nature, such as never give any pain; and in this state the testis ought never to be extirpated.

This is a point, we may remark, which it is of some importance to ascertain: For on the idea of these enlargements of the testes, frequently connected with, and perhaps produced by, their immersion in the water of a hydrocele, being of a real scirrhous nature, their extirpation has been often advised, and unfortunately too often practised.

In circumstances of this kind the means of distinction between the mild and malignant species of enlarged testicle, by which we should in general be directed, are the following.

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When the body of the testis becomes hard and enlarged, previous to any collection of water in the tunica vaginalis, such collections as afterwards occur ought not to be considered as constituting a simple hydrocele; and if, upon evacuating the water by incision, the testis, besides being enlarged, is found in a hardened state, and especially if it is attended with pain, and is ulcerated on the surface, extirpation ought undoubtedly to be advised immediately: And, on the contrary, when the water of a hydrocele is known to have been collected while the testicle remained found and of its natural size, whatever enlargement it may be found to have acquired on laying the sac open, if the testis is neither of a scirrrous hardness, nor affected with pain or ulceration, we ought unquestionably to proceed as in a case of simple hydrocele; for any enlargement of this kind will be rarely found to occasion future uneasiness, and consequently will seldom or never render extirpation necessary.

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In forming a prognosis of this disorder, different circumstances are to be attended to ; the age, and habit of body, of the patient ; the duration of the disease, and the state it is in at the time.

Thus, whatever treatment is to be adopted, more success may be reasonably expected in a young healthy constitution than in the reverse ; particularly if extirpation of the testis is to be advised. In the former, the chance of success from the operation is commonly considerable, provided the disorder be not too far advanced ; whereas in old, infirm people, and in habits attended with pale, wan complexions, with indigestion, and other symptoms of obstructed viscera, whatever state the disease may be in, little or no advantage can be expected to accrue from any operation.

With respect to the duration of the disease, if it has already subsisted for a considerable time without making much progress, there will be great reason to think that it is of a mild nature ; and that the system, in general, is not so much affected

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by it as if its progress had been great and rapid; and lastly, the state of the disorder for the time is of much importance in forming an opinion of its final event. As long as the testicle is only somewhat hard and enlarged, without the formation of matter, and without any disease of the cord, if the constitution is otherwise healthy, there will be much reason to expect a favourable event from any operation that ought to take place.

But on the contrary, when the disorder is so far advanced that collections of matter have formed, either upon the surface of the testicle, or in its more internal parts, as in that state the constitution will probably have suffered from absorption, so there is less chance of the operation in these circumstances proving so successful as in the more early period of the disease: And this is still more remarkably the case when the tumor has become ulcerated externally; for we know well, that in all such cases, the system is much more apt to suffer from absorbed matter on the parts

parts being laid open, than while they remained excluded from the external air.

In whatever state, however, the tumor may be, there is always reason to expect more success from the operation while the spermatic cord is yet sound, than when it has become much diseased; for, as soon as the cord is materially affected, the chance of success from any means to be attempted is always proportionably lessened. The cord, indeed, may towards its under extremity be diseased, even in the same manner with the testis itself, without lessening the chance of benefit from the operation; but whenever the disorder has spread so far up the spermatic process as to render it doubtful whether the parts affected can be all removed by the knife or not, and especially when it is once rendered clear that the cord is diseased within the boundaries of the abdomen, instead of there being in such circumstances any advantage to be expected from the operation, every attempt towards the removal of the parts below, will for certain tend to

aggravate every symptom, and will be a means therefore of forwarding the patient's death.

Whenever a scirrhouſ or cancerous tumor is ſo ſituated as to render its total removal by the knife quite practicable, it ought always to be advised; but when the disease has advanced ſo far as to render this imposſible, in whatever part of the body it may be ſituated, no attempt of this kind ought to be made, the fact being now clearly ascertained, that cancerous affections are always rendered worse by extirpation, when all the diseased parts cannot be removed.

It is of much importance, however, to obſerve, that the ſpermatic cord is in this disorder frequently affected with a fulneſs and thickness of its parts, produced merely by the weight of the tumor, without being in any other respect diseased. A fulneſs of this kind, when no pain occurs in the cord itſelf, and when there are no knots or inequalities upon its ſurface, ought never to prevent the operation, when in
other

other respects it appears to be necessary; as a mere enlargement of it very frequently occurs, either from a varicose state of the vessels, or from a watery deposition in the cellular substance of the part, when the process is not in any other manner diseased*. But on the contrary, when the cord, at the same time that it has become considerably enlarged, hard, and knotty, adheres to the neighbouring parts, is painful to the touch, and especially if it is already ulcerated; these, if the disorder extends over the whole process up to the abdominal muscles, are circumstances which, with every prudent practitioner, will at all times forbid the operation of castration.

It has indeed been proposed, in such a state of the cord, to enlarge the opening in the external oblique muscle, so as by dissection to trace the diseased parts even into

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* Of what is here inculcated we have some singular proofs in Mr Pott's Collection of Cases, which we have so often referred to as a depositary of useful facts. See Cases xxxix. xl. xlix. and l. Treatise on the Hydrocele.

the cavity of the abdomen, with a view to extirpate them entirely. But although theoretical writers may attempt to amuse their readers with such proposals, they will never be seriously thought of by practitioners whose opportunities for observation enable them to think and act for themselves.

We do not think it necessary to say anything, either of the effect of internal medicines, or of external applications, in the removal of this disease; for in the real sarcocèle, or scirrhouſe testicle, no remedy with which we are acquainted has any kind of influence. Even cicuta, the powers of which are so much extolled, does not appear to be in any degree useful, either in carrying off the disorder entirely, or in mitigating any of its symptoms. The only remedy, therefore, from which we at present reasonably expect any advantage, is the removal of the diseased parts by extirpation; so that the most important matter to be here determined, is that period of the disease in which the operation is most advisable.

We have already observed, that cases of scir-

scirrhouſe testicle do now and then occur with which patients go about for a great length of time with little or no inconvenience: Such instances, however, are exceedingly rare; for, by much the greatest proportion of all ſuch affections, prove to be of a dangerous malignant nature.

With respect to this point, therefore, we may ſhortly determine, that, whenever a scirrhouſe or hardened ſtate of the testicle does not yield to the means commonly employed, ſuch as moderate evacuations of blood when these are indicated; a soft easy diet; a lax belly; the uſe of a ſuſpenſory bandage; and eſpecially when mercury, which, on the chance of the disorder being venereal, is very commonly tried, all are uſed without any effect; we may in ſuch circumstances always have great cause to ſuspect that the disease is of a truly bad nature. When more inveterate ſymptoms appear; when the tumor, which till now was in a hard indolent ſtate, becomes painful, and is evidently going on to acquire an additional bulk; no farther delay ought then

then to be advised: For however improper it would be to remove a hardened testis, which for a considerable time had remained indolent, without pain or any increase in bulk, yet it would be equally unpardonable in any practitioner to recommend a delay of the operation when matters are so far changed that the tumor is become painful, and is daily becoming larger. In such circumstances, the sooner the diseased parts are removed, the greater will be the chance of a recovery, and not a day therefore should be lost. For whatever may have been the opinion of a few individuals on this point, it has long been a fixed maxim with the most experienced surgeons, that, in all scirrhouſe or cancerous affections, the risk of a relapse after the operation is commonly in proportion to the duration of the original disease*.

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* The opinion of the late Mr Sharpe on this point was singular in a man of such extensive experience. He considered the risk of a relapse after extirpation in cancerous tumors to be greater in the more early periods of these diseases than in their more advanced states. *Critical Inquiry*, 4th edit. p. 108.

The extirpation of the testicle being at last determined upon, the method of performing the operation is this: The patient must be placed in a horizontal posture on a table of a convenient height, with his legs hanging down, to be firmly secured by an assistant on each side. The parts being previously shaved, if the tumor is very large, an assistant must be employed to secure it properly; if only, however, of a moderate size, it is better for the surgeon to do it himself. With one hand, therefore, he ought to grasp the swelling so as to keep it firm, and with a scalpel in the other should make an incision along the whole course of it, beginning at least an inch above the part where the cord is to be cut, and continuing it through the skin and cellular substance to the inferior point of the scrotum. The easiest method of doing this, we may observe, both for the surgeon and patient, is by one continued stroke of the knife; as it is both more quickly and more neatly performed in this manner, than in the usual way of pinching

ing up the skin between the finger and thumb before cutting it; and there is no kind of difficulty or risk in doing it in the manner we have here directed.

The spermatic cord being thus laid bare, the surgeon is now with the finger and thumb of one hand to endeavour to separate the spermatic arteries and veins from the *vas deferens*; which is for the most part easily done, and which ought never to be omitted, for it is in no degree necessary to include the nerve in the ligature: And this being done, a firm, waxed flat cord, composed of a number of small threads, is by means of the curved needle, Plate V. fig. 4. to be carried round the blood-vessels, which are thus to be secured by a running knot about a quarter of an inch above that part of the cord which is to be divided.

The cord being at this part cut across, the testicle is then to be entirely removed, by dissecting the cord and it from above downwards, so as to separate them as easily as possible from the surrounding parts. Different contrivances have been proposed
for

for facilitating the separation of the testis from the contiguous parts; but no invention with which we are acquainted answers this purpose so well as a scalpel.

When the diseased parts are all removed, the knot upon the cord should be untied, in order to discover the spermatic artery and vein, which by means of the tenaculum may generally be separated from the nerve with which they are in contact; and whenever this can be done, they ought unquestionably to be secured in this manner; for, by including the nerve, no advantage whatever is obtained, and it always renders this a very painful part of the operation. I have seen more pain, indeed, complained of in tying the spermatic cord in the usual way, than I was ever witness to in any part of almost any operation; so that whenever the nerve can be separated from the other parts, as it very commonly with a little attention may be, it ought always to be left out of the ligature*.

When

* *Vide Chirurgical Cases and Observations, by Mr Bromfield, Vol. I. p. 336.*

When it so happens, however, that this cannot be done, the ligature must then be applied in the ordinary manner, and be made to surround the blood-vessels and nerves indiscriminately; care being taken to make no more pressure with the knot than is just necessary for preventing any discharge of blood.

We have desired, that in securing the divided blood-vessels, both the artery and veins ought to be tied; for if the veins are not included in the ligature, a good deal of blood may be discharged from them, as they are not furnished with so many valves as the veins of other parts of the body.

The cord passed at the upper part of the process is to be left entirely loose, and to serve only as a tourniquet for securing the blood-vessels more readily in case the ligatures passed upon them should accidentally slip. There is in fact no more necessity for allowing this ligature to remain tied, than there is for leaving a tourniquet firmly applied upon any of the extremities after the operation of amputation; and yet, instead

stead of one ligature of this kind, it has been the practice with many, to apply two, about half an inch distant from one another, by way of very great security; and these they leave firmly tied upon the whole substance of the cord during the cure of the sore*.

There is, however, no kind of necessity for this precaution, as all manner of risk may be entirely prevented by securing the blood-vessels in the manner we have here directed. I have often done the operation in this way, and I never saw any inconvenience produced by it. By leaving the ligature at the upper part of the wound untied, it may be made use of to compress the cord in the event of the blood-vessels bursting out again: But when the operation is properly done, this is an occurrence that will be very seldom met with; and at any rate, when it does unfortunately happen, it may be always prevented from producing much mischief by the ligature left for that

* Even the late Mr Sharpe gives these directions.
Treatise on the Operation of Surgery, 10th edit. p. 55.

that purpose, and which may with safety be removed at the second or third dressing of the sore.

In making the ligature of the blood-vessels at the extremity of the cord, if it is necessary to divide the process near to the abdominal muscles, as there is a possibility of its retracting for a small space so as to get it within the ring, the ligature ought to be cut of such a length as to admit of this; a few inches of it, therefore, should be always left hanging over the sore, so that it may be pulled away at a proper time, in the event of any retraction taking place. But we may here observe, that this retraction never happens, when the cord has not been too much separated from the surrounding parts in endeavouring to introduce the ligature below it. Indeed, no farther separation should be attempted than merely to raise the cord so far as to get the point of the needle introduced between it and the bone.

In prosecuting the removal of the testicle, the scrotal artery is necessarily divided, and

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it is sometimes of such a size as to discharge a great deal of blood; in which case it should always, before going farther, be secured by a ligature.

The parts being all removed, and the different blood-vessels all secured as we have here directed, a quantity of soft lint should be gently laid into the bottom of the sore; and a compress of linen being applied over it, the whole should be secured either with the T-bandage, or with the suspensory bag usually employed in affections of the scrotum. The patient being now laid to rest, and an opiate administered, the sore ought not to be touched till a free suppuration takes place, which will commonly be about the fifth or sixth day; and then the dressings should be removed, and renewed from time to time once every two days or oftener, according as the quantity of matter renders it necessary. Now and then, after this operation, the patient complains of much pain in the sore, and of tension and uneasiness in the belly; in which event, warm fomentations should be applied

to the abdomen, and the sore itself should be covered with an emollient poultice, to be repeated as often as may be necessary.

In describing the manner of performing this operation, we suppose it to be done in a case where the testicle has not arrived at any great bulk: In such a situation there is never any good reason for removing any part of the scrotum, as has been commonly advised *; for if the teguments are not diseased, or rendered very thin by being much overstretched, they always recover their tone very soon, and should not therefore be removed.

But, when the skin has become very thin and inflamed, and especially if any of it is actually in a state of ulceration, all such parts of it ought to be removed along with the testicle. In such circumstances the best method of doing it is this: Instead of a longitudinal incision along the course of the testicle, the first incision ought to be carried in a straight line to the under

* Mr Sharpe in such cases advises a portion of the scrotum always to be removed, p. 55. *loc. cit.*

under extremity of the spermatic cord; from whence two semilunar incisions ought to be continued to the under part of the scrotum, and should be made to include all the parts of the skin that are in any degree diseased.

In this situation the remainder of the operation ought to be exactly the same as we have already described: The skin included by the two semilunar cuts is not to be dissected off, but ought to be removed at once with the diseased testicle.

C H A P. X.

Of the Diseases of the PENIS.

SECTION I.

Of the Phymosis.

THE glans penis is naturally provided with a covering termed the *prepu-*
L 12 *tium;*

tium ; formed by an elongation and doubling of the skin. This in a healthy state is in general of such dimensions as to pass easily over the glans, but by disease it is frequently prevented from doing so; and when the prepuce has got forward, and cannot be drawn back over the glans, the disease thereby produced is termed a Phymosis.

This complaint is induced by whatever tends to swell the glans, or to excite inflammation and stricture in the preputium ; and in some people, the prepuce is so tight, as to render them liable to complaints of this nature from very trifling causes. An exfudation of a whitish, viscid matter between the prepuce and glans is natural to many ; and the disease now under consideration, is frequently the consequence of want of cleanliness, by which this matter is allowed to rest till it becomes acrid : But the most frequent cause of it undoubtedly is the application of the venereal virus to these parts, by venereal intercourse with diseased women.

In

In slight affections of this kind, especially when the disorder has not been of long continuance, fomenting the parts frequently in any warm emollient decoction, commonly gives relief; or what answers perhaps better for such purposes than any decoction, is warm milk; this, together with the use of emollient poultices with a view to relax the constricted preputium, will often answer so effectually as to render any other application unnecessary.

At the same time that fomentations and poultices are applying in this manner externally, part of the fomentation ought to be injected from time to time by means of a syringe between the prepuce and glans, in order to wash away any matter, either of concealed chancres, or that may be produced merely by the inflammatory affection of the part.

When the parts are much inflamed, blood-letting often proves serviceable: When the superficial veins of the penis can be opened, any blood to be discharged should be taken from one of them by the

lancet; but when they do not appear conspicuous, discharging it from the arm will answer as well as from any other part: Local blood-letting by means of leeches would be here particularly indicated; but when the disorder has originated from a venereal taint, the bites produced by these animals almost constantly terminate in troublesome sores. Together with a discharge of blood proportioned to the strength of the patient, gentle laxatives should be prescribed, a low diet, and abstinence from exercise.

When, however, it is found that even a due perseverance in these means has no influence in removing the disorder, and especially if chancres are confined under the prepuce, which might injure the glans by the matter discharged from them not getting a proper vent, in that case it becomes necessary to remove the stricture by an incision carried along the whole course of the preputium.

As the skin of the prepuce is exceedingly lax, it is almost impossible to cut it with neatness and accuracy in the ordinary way,
either



Plate XI.

Fig. 1.

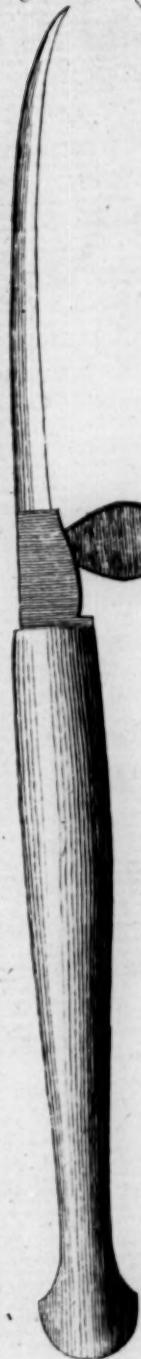


Fig. 2.



Fig. 3.



Fig. 4.



A Bell. Sculp^t

either by a scalpel or bistoury; and when done in this manner, the skin yields so much before the instrument, as always to render it a very tedious and painful operation: Neither are the probe-scissars well calculated for doing it properly, as the parts are commonly so thick as to be much bruised by the blades of the instrument.

These inconveniences in this operation being exceedingly obvious, many inventions have been proposed for effecting it more easily. In Plate XI. is represented an instrument which I had made for this purpose several years ago, and it answers the intention very effectually and with much ease.

It consists of a director with a small curve at its extremity, to which a sharp-pointed bistoury with a very narrow blade, is so exactly adapted, as to have the cutting part of it entirely concealed in the groove of the director, which ought to be about a quarter of an inch longer than the blade of the knife.

The knife being inserted into the direc-

tor so as to be concealed by it entirely, the instrument in this state is to be insinuated between the prepuce and glans on one side of the penis, till the director is found by the finger to have reached the upper end of the preputium. The operator is now to keep the director firm with one hand, and with the other is to push the knife forward, so as to make its point pass thro' the prepuce; and the director being withdrawn, the operation is finished by drawing the knife forward so as to make it divide the prepuce through its whole length along the side of the penis.

In this manner the preputium is preserved in a tense state while the division is going on, by which means the operation is very easily accomplished: And by making the division on the side of the penis, the large veins of the part are avoided, which they could scarcely be if the operation was done in the back part of it.

The prepuce being thus divided, the parts below ought to be bathed with warm water so as to wash off effectually any acrid

matter

matter with which they may be covered; and this being done, the sore should be covered with a bit of soft lint; and a compress of old linen being laid over it, the whole may be very effectually retained by a small linen bag adapted to the size of the penis, to be secured by two straps pinned to a circular bandage made to surround the body. This bag must indeed be always removed when the patient makes water; but this is easily done; and it retains the dressings, not only more effectually, but with more ease to the patient, than is ever done either with adhesive plasters or any other form of bandage.

In the after-dressings of the sore, care should be taken to insert a piece of soft lint between the divided prepuce and glans, otherwise troublesome adhesions are apt to occur between them: I have met with several instances of this, which gave much distress to the patients, and which by a little nicety and attention in dressing the sores might very easily have been prevented.

It is scarcely necessary to observe, that
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when any venereal infection subsists in the constitution, the sore produced by this operation will not readily heal, if the patient be not put under a proper mercurial course. In such circumstances therefore, if mercury has not been previously administered, it ought always to be prescribed immediately on the operation taking place.

In some cases of phymosis, the preputium is found to be so very long, that instead of dividing it longitudinally, the operation of circumcision answers the purpose better; and it is very easily effected, by taking away such a portion as may appear requisite, of the whole circumference of the prepuce. In such circumstances, when the prepuce is naturally too long, the removal of a quarter or half an inch of it often frees the patient from what even before the approach of this disease he had found to be inconvenient; and as the removal of the extremity of the prepuce in general allows the remainder to retract easily, the operation is accordingly now and then performed in this manner.

S E C T-

SECTION II.

Of the Paraphymosis.

BY the term Paraphymosis is meant a morbid retraction of the preputium, producing stricture behind the glans penis. This disease, like the former, is induced most frequently by a venereal taint: but it will arise from whatever tends to produce, either a preternatural fulness in the glans, or a constriction of the prepuce; and more especially from such causes as affect a complication of both.

In the incipient state of this disorder, by a little attention and dexterity, the prepuce may be sometimes brought over the glans, by the surgeon pushing the nut gently back with both his thumbs, while his fingers are at the same time employed in moving the prepuce easily forward. In the more advanced state of the disease, however, no attempt of this kind ought to be made, as it is in the commencement of it only that it is ever known to succeed; and when it does not prove useful, it is apt to do

do harm, by inducing an increased degree of irritation in the parts to which the pressure is applied.

As the paraphymosis seems evidently to be more frequently induced by an enlargement of the glans than by any original affection of the prepuce, so the stricture in the latter is not here so effectually relieved by warm fomentations, as it commonly is in the phymosis, where the disorder is most frequently produced by an affection of the prepuce itself. In the paraphymosis, indeed, I have often seen much harm done by applications of this kind; as they evidently tend to produce an increase in the swelling of the glans, by which the stricture in the prepuce is always proportionally increased.

Nothing in general answers so well here as the saturnine applications. Such swellings, indeed, will often subside by being frequently immersed in a cold solution of saccharum saturni, when no other remedy has any influence. But, when the penis is evidently much swelled and inflamed, together

gether with this application to the part, the patient ought to be kept cool, gentle laxatives should be prescribed, and discharging blood from one of the superficial veins of the penis is sometimes of use.

By a due continuation of these means, and by keeping the patient on a low diet, this disorder will most frequently be removed : But when, notwithstanding the use of these remedies, the disease proceeds to increase, by the swelling in the glans becoming more considerable, and the stricture of the prepuce increasing, an œdematosus swelling begins to appear in the latter, which on some occasions acquires a considerable degree of magnitude; and unless relief be now obtained by a complete removal of the stricture, mortification of the glans itself is very apt to occur.

When, therefore, none of the remedies we have recommended prove effectual in preventing this stage of the disorder, we are now to attempt to remove the stricture by an operation ; and the easiest method of performing this, is, with the shoulder of a lancet

lancet to make a deep scarification on each side of the penis, directly behind the glans; taking care to make each cut of about half an inch in length, and of such a depth as effectually to divide the prepuce just at its termination.

The parts ought now to be allowed to bleed freely, as this circumstance of itself in general affords immediate relief; and as soon as the hemorrhagy stops, a pledgit of any emollient ointment being applied to the fores, and a soft well-made poultice being laid over the whole, if the scarifications have been carried entirely through the stricture, nothing farther will in general be necessary than dressing the parts daily with the same ointment with which they were at first covered: but, if they have not been made of a proper depth, it will be afterwards necessary to renew them; when care must be taken to do the business effectually.

In the phymosis, it was recommended to put the patient under a mercurial course whenever there is the least reason to suspect that

that any venereal taint subsists in the constitution; and the same precaution, it is evident, must be equally proper in cases of paraphymosis.

SECTION III.

Of Amputation of the Penis, &c.

THE penis, like other parts of the body, is liable to disorders, which sometimes renders it necessary to remove the parts affected by amputation.

Thus we know, that on some occasions the penis is seized with mortification, and it is frequently attacked with sores of the cancerous kind: And when mortification has been induced either by a neglected paraphymosis or by any other cause, it becomes necessary to remove the diseased parts; as is likewise the case when any part of the penis is seized with a cancerous sore, which, instead of healing by the means regularly employed for its removal, proceeds to turn worse.

We have elsewhere entered fully into the
con-

consideration both of cancerous disorders and of mortification *. To what was then said respecting the treatment of these affections we must now refer, and shall at present attend only to the operation of amputating the penis whenever it has become so diseased as to render this necessary.

A circular incision ought to be first made through the sound skin at the farthest extremity of the sore, and the skin should be then drawn back by an assistant; when the body of the penis should be cut through by one stroke of the scalpel, care being taken to remove every part that appears to be in any degree diseased.

This being done, such arteries as bleed freely should be carefully searched for, and ought by all means to be secured by ligature. In general, two, and sometimes three branches, of an artery will be met with; and they should all be secured in this manner. But even after the principal arteries have been tied, a considerable oozing

* *Vide* Treatise on the Theory and Management of Ulcers, &c.

ing of blood usually occurs from the surface of the sore, which the sprinkling with starch or gum arabic in fine powder will sometimes command; but when this does not answer, a small silver canula being introduced into the urethra, and retained there by a proper bandage, any farther discharge of blood may be very easily stopt by a slight compression made with a narrow roller upon the remaining parts. A very slight compression answers the purpose, such a degree of it indeed as has no influence in hurting the parts on which it is made; and as there is no necessity for the tube inserted into the urethra being of a great length, it is easily retained during the whole cure without being productive of much inconvenience.

In Plate IX. fig. 4. is represented a tube which I have on different occasions used for this purpose. *A.* the tube itself; *B. B.* two ligatures for connecting it to a bandage passed round the patient's body.

Heister and some other authors, being afraid of the hemorrhagy produced by amputation of the penis, advise it to be

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done by means of a ligature. A ligature being applied with sufficient firmness a little above the diseased parts, they are thereby made to fall off in the course of six or eight days; but whenever a part can be removed by the scalpel, it is done with much more ease and certainty than by ligature.

Others, again, have said, that there is little or no danger to be apprehended from any discharge of blood that can ever occur here; but this I know from experience is far from being the case. In the course of one season, I had occasion to perform this operation three different times in the Royal Infirmary here; and in the first I was persuaded by a gentleman who had found it in one case to succeed, not to secure the arteries by ligatures, but to trust entirely to compression. This was accordingly done; but unfortunately, in the course of an hour or two after the operation, such a profuse hemorrhagy supervened as terminated in the patient's death.

In the next that occurred I was resolved to secure every branch of an artery that could

could be laid hold of. Three different arteries were accordingly tied, and no hemorrhagy ensued. In the third operation two branches of an artery were secured; but a plentiful oozing still continuing from the sore, the silver tube above mentioned was introduced into the urethra, and a slight compression being made upon it, the hemorrhagy was thereby effectually stopt.

When any arteries that appear have been secured in the manner directed, the parts ought to be covered with pieces of soft lint sprinkled with starch or gum arabic in powder; and a compress of linen, with a hole in it large enough to pass over the canula in the urethra, being laid over the whole, and the T-bandage being employed to retain it, all the dressings may in this manner be effectually secured. And the after treatment of the sore should be similar to that of wounds in any other part.

In proceeding to this operation it ought to be kept in view, that the prepuce is frequently so much enlarged and ulcerated, as to give cause to suspect the glans and

M m 2 other

other parts below to be much diseased, when in reality they are perfectly sound. I once saw an instance of this, where the appearances previous to the operation were such as gave no reason to doubt of the glans being affected; and the prepuce with part of the penis were accordingly taken off, when it afterwards appeared that the glans might have been saved, as the disease was found to be entirely confined to the prepuce.

In every case, therefore, where there is not an absolute certainty of the glans being affected, all the diseased prepuce should be first removed; and the state of the parts below being examined, if they are found to be so much affected as to render amputation necessary, this can be then done with as much ease as if they had been taken off along with the prepuce; and on the contrary, if they are discovered to be sound, both the surgeon and patient will have much cause to rejoice.

It sometimes happens, that the frenum of the penis is so short as to create a good deal of uneasiness to the parts when in a
state

state of erection. But as there is no danger to be dreaded from a division of this ligament, whenever it proves troublesome it may with great safety be cut across; and it is very easily done with a pair of probe-pointed scissars: After the frenum is fairly divided, a bit of soft lint ought to be inserted between the lips of the wound, otherwise the parts newly separated will be apt to re-unite immediately.

On some occasions, the urethra in male children is found to be incomplete, by terminating before it reaches the extremity of the yard. Now and then it does so without any external opening, and at other times it terminates by a small orifice at some distance from the end of the penis.

When no opening is discovered outwardly, if the urine is found to stop at any particular part, the introduction of a small trocar from the point of the yard along the course that the urethra ought to take, and carrying it forward till it meets with the urine, will always afford immediate relief; and by the use of small bougies the sides of the passage may be ren-

M m 3 dered

dered callous, and a clear opening be thus preserved. But when any opening is discovered, although it should not be properly placed, yet if it affords a temporary passage to the urine, it is better to delay the operation till the patient is somewhat advanced in life; and on an opening being then made with a trocar in the manner we have mentioned, a piece of flexible catheter may be introduced, not only for preserving the passage free and pervious, but for carrying off the water till a cure is obtained. In the earlier periods of childhood, the smallness of parts through which it ought to pass, renders the flexible catheter altogether inadmissible.

Independently of these affections of the penis which we have been just considering, fistulous openings frequently occur in the urethra, and they are always productive of much distress. These we shall attend to when we come to treat of the Fistula in Ano and Perinaeo; and the treatment of Stones impacted in the Urethra, will fall to be considered under the operation of Lithotomy.

EXPLANATION OF THE PLATES.

PLATE I.

[Opposite to page 22.]

Fig. 1. A form of hook, commonly termed a tenaculum, for the purpose of pulling out bleeding vessels to be tied by ligatures.

Fig. 2. and 3. Two needles of a different curve from those in ordinary use. The curvatures being altogether on their fore-parts, and the handles perfectly straight, they are thereby more easily managed than the others, particularly in deep wounds. Fig. 5. and 6. represent two needles of the usual form; but neither these nor the other two have an edge on their concave parts. They are made somewhat round like a lancet, both on their convex and concave sides; which adds to their strength, and makes

M m 4

them

them enter with more ease than the others. I have long made use of those needles, and whoever employs them will find them preferable in every respect to the others.

Fig. 4. and 7. Two straight needles for fusions of the intestines and other delicate membranous parts.

All these needles are represented of the full size.

A number of instruments have been contrived for holding the needles when they are to be employed in deep wounds. The Porte-aiguille represented in Plate II. will answer this purpose as well as any other; but instruments of this kind cannot be often needed.

PLATE II.

[Opposite to page 32.]

Fig. 1. A Porte-aiguille mentioned in p. 32.

A.A. The handles of the instrument.

B. A groove for receiving the pins used in the twisted suture.

This instrument is commonly made with a slider for fixing the handles after the pins are

are inserted into the groove ; but as this always proves troublesome to the operator, and is not in any degree necessary, it is here purposely omitted.

Fig. 2. 3. and 4. are different sizes of pins used in the twisted suture described p. 29.

And fig. 5. is a flat needle sometimes found useful in stitching blood-vessels that lie between contiguous bones.

All the instruments in this plate are represented of their full size.

PLATE III.

[Opposite to page 42.]

Fig. 1. A screw tourniquet, described p. 43. Every part of the instrument is here represented of the full size : It may be made either of brass or steel ; and the strap connected with it ought to be of very firm materials, at least an inch broad, and of a length sufficient to pass fully round the largest circumference of any of the extremities.

Fig. 2. A spring phleme, described p. 86,
89.

89. This instrument is also represented of the full size.

P L A T E I V.

[Opposite to page 88.]

Fig. 1. and 2. Two scalpels of the best form, either for the anatomist or surgeon. Fig. 1. is of a size large enough for any operation; and fig. 2. is of a very useful size for operations about the eyes, mouth, and other parts where a larger instrument proves inconvenient.

Fig. 3. and 4. The best form of lancet for the operation of blood-letting, described p. 90.; fig. 3. is of a full size for any purpose of this kind; and fig. 4. is for the small veins of infants.

Fig. 5. represents the broad-shouldered lancet in ordinary use; but which, from its figure, is evidently ill-suited for the nice operation of venæflection.

P L A T E V.

[Opposite to page 172.]

Fig. 1. A scarificator with sixteen lancets,
A,

A, a cubical brass box, in which the blades of the lancets firmly fixed on an axis are included. *B*, a lever for bending a spring with which the axis and its lancets are connected. *C*, a button or head of a screw-nail connected with a catch for securing the spring in a bent state: On the spring being bent by means of the lever *B*, and the flat part of the instrument *DD* being placed upon the part to be scarified, the button *C* is then to be pressed upon till the spring is unbent, which forces the lancets into the parts they are placed upon, to the depth at which they have been previously set; and the flat covering of the box *DD* being moveable, serves to regulate the length of the lancets which pass through it.

Fig. 3. A cupping-glass with a mouth of an oval form; and fig. 4. represents one of the ordinary round kind.

Fig. 2. A strong curved needle, with a round though somewhat sharp point. This instrument answers the purpose better than any yet contrived, for introducing ligatures below the artery, in the operation for the aneurism;

aneurism; and below the spermatic cord, in the operation of castration.

All the instruments of this plate are represented of a proper size for use.

PLATE VI.

[Opposite to page 289.]

Fig. 1. 2. and 3. represent different parts of a machine for injecting tobacco-smoke by the anus.

Fig. 1. A brass box for containing the burning tobacco. The mark *A* is a bottom or division in the inside of the box, perforated with small holes to admit the passage of the smoke to the extremity of the box *B*; which, by a male screw, is adapted to a brass tube, fig. 3. at *D*, which is again fitted to an elastic leather-pipe *E*, terminated by a common glyster-pipe *F*. The pipe *E* is made of waxed leather, protected by brass-wire rolled spirally round it from one extremity to the other.

Fig. 2. represents the covering of the box, fig. 1. to which it must be exactly fitted. *G*, a division of thin brass, perforated

forated with a number of small holes for admitting the passage of the air from a pair of bellows fitted to the opening *H*.

Fig. 3. The instrument completely fitted up on a small scale. *I* a pair of double bellows, whose tube *K* is fitted by a screw to an opening in the cover of the box *L*, which again is terminated by the brass tube *M*, the leather-pipe *N*, and the ordinary glyster-pipe *O*.

The box *L* being filled with burning tobacco, and the glyster-pipe *O* being inserted into the anus, by working the bellows *I*, any necessary quantity of smoke may be very quickly thrown up.

It is scarcely necessary to observe, that all the parts of this machine ought to be exactly fitted to one another, with a view to prevent effectually the escape of smoke at any of the joints.

Bellows of the ordinary size answer very well for this purpose; and are preferable to those of a smaller size, as being better calculated for injecting the smoke quickly. The brass-box for the tobacco should be about

about an inch and half in diameter, by three inches in length from the brim to the bottom; the brass-tube connected with the box should be six inches in length, by a quarter of an inch in diameter. The leather-pipe ought to be of nearly the same diameter with the tube, and about two feet and a half in length. When of this length, it is easier managed than when shorter; and it serves more effectually to cool the smoke before it is thrown into the bowels.

The glyster-pipe at the end of the leather-pipe ought to be somewhat larger and wider than those in ordinary use.

PLATE VII.

[Opposite to page 290.]

Fig. 1. Another instrument for the purpose of injecting tobacco-smoke, originally invented by the celebrated professor Gau-bius. The principal difference between this and the instrument represented in Plate VI. is, that in this the tobacco-box *A*, is fitted to the air-hole of the bellows; so

so that in working the bellows, the air with which they are supplied entering in at the openings *B*, the smoke of the burning tobacco must accordingly pass through them; and from the bellows it is thrown into the other parts of the instrument, and in that manner is transmitted to the intestines.

The other instrument represented in Plate VI. is wrought with more ease than the one here delineated.

Fig. 2. A crooked bistoury, with a blunt or probe point. The curve here represented is much less than is usually given to this instrument, and the blade is also much narrower: It ought, indeed, to be altogether straight, excepting a very slight curvature towards its point.

This bistoury is well calculated for dividing the stricture in cases of hernia; for opening sinuses in every situation; and particularly for dividing the rectum in the operation of the fistula in ano.

Fig. 3. A bandage for compressing the temporal artery, either after the operation
of

of Arteriotomy, or in accidental divisions of that artery. It is made of well tempered spring-steel, covered with soft leather, and of the same strength as is used for the truss of a hernia. The wound being dressed, and a small compress of linen being applied over it, the limbs of the instrument are to be opened, and applied over the back-part of the head, so that their extremities *B D* may rest upon the temples, and one of them be made to rest exactly upon a compress covering the wound. If the instrument is made of proper metal, and of sufficient strength, it will remain exactly upon the part on which it is first placed without any assistance; but, to prevent its being rubbed off by accident, it is here furnished with a buckle and strap *A C*, by which it may be firmly fixed by drawing them tight upon the fore-head.

This instrument should be about three quarters of an inch broad; and from twelve to fourteen inches in length will answer for the dimensions of any head.

I once had a screw with a button adapted

ed to this bandage, the button being made to press upon the divided artery; but the compress of linen here recommended, answers the purpose better, and is easier to the patient: Bandages made of linen or of other materials of a yielding nature, do not answer so well as those of spring-steel, which always remain with more certainty on the spot they are first placed upon.

PLATE VIII.

[Opposite to page 309.]

Fig. 1. A spring truss for an inguinal or femoral hernia of the right-side. *A*, the bolster or pad for pressing upon the opening at which the parts have been accustomed to protrude. *B*, a strap with holes in it for fixing upon the knobs on the back part of the pad. *C*, a strap hanging down from the back-part of the bandage, to be passed between the legs of the patient, and to be also fixed upon the knobs of the pad by the holes in its extremity.

This strap is intended to fix the bandage firmly in its situation; but if the

VOL. I. N n bandage

bandage is properly fitted to the parts, and if the steel-spring of which it is composed is sufficiently elastic, there is no necessity for the intervention of this strap, which always frets and galls the parts upon which it is made to pass.

Fig. 2. represents a bandage of this kind for the left-side with no back strap.

Fig. 4. represents a double bandage of the same kind for a hernia on each side, with two back-straps connected with it.

The steel of which these bandages are made should be covered with thin soft leather, properly stuffed with wool or flannel, in order to prevent the parts from fretting by the pressure necessarily produced upon them. The pads ought to be broader than they are generally made, with a prominence or slight elevation in the middle, while their sides are made perfectly flat. Of this construction they apply with much more exactness, and fit more firmly on the parts than when altogether round, as they are commonly made, without any flatness on their sides.

Fig. 3.

Fig. 3. represents a bandage for umbilical ruptures. *A*, a steel spring to be applied upon the umbilicus after the hernia has been reduced, and to be retained in that situation by the bandage *B*: which, by means of the strap *CCC* and the buckles *DDD*, may be kept at any degree of tightness. *EE*, two straps for passing over the patient's shoulders; and *F* a strap for passing between the legs, the whole to be fixed upon knobs on the back part of the bandage opposite to the spring *A*. By means of these buckles and straps the bandage may be preserved very firm, in its situation.

The belt *B* should be five or six inches broad, and the steel spring *A* should be of a size proportioned to the opening it is intended to press upon. All the parts of the bandage should be made of soft leather, lined with flannel or cotton *.

N n 2 PLATE

* The spring here represented is taken from a figure represented by the late Dr Monro in his treatise on that subject. See his Works in 4to.

PLATE IX.

[Opposite to page 380.]

Fig. 1. A pessary for the prevention of herniæ in the vagina. This pessary consists of a conical tube of ivory, silver, or gold, with a cord at its extremity, for the purpose of withdrawing it when necessary. The protruded parts being reduced, and this cone being rubbed over with oil, is to be introduced into the vagina, by which any farther descents may in general be prevented.

Pessaries for this purpose have been formed of spring-steel; but the rust which instruments of that metal are apt to contract renders them very unfit for such uses.

Fig. 2.. A hook described p. 376, for enlarging the opening in the foramen ovale in cases of hernia of that part. This hook was originally proposed by Mr Arnaud, a French author, for dilating the passage at which the parts protrude in cases of crural hernia.

Fig. 3.

Fig. 3. A director open at the extremity, described p. 324, for the purpose of laying open the sac in the operation of the bubonocele.

Fig. 4. A silver canula for introducing into the urethra after the operation of amputating the penis. The strings with which it is furnished are intended to fix it to a circular bandage which ought to pass round the patient's body.

PLATE X.

[Opposite to page 420.]

Fig. 1. A trocar of a proper size for evacuating the contents of an encysted hydrocele. By the flatness of its form, and its point being of the lancet kind, this instrument penetrates the cyst with great ease; and can thereby be used with more safety than the ordinary form of this instrument.

The point of the perforator is commonly made much longer than is necessary. It ought not to pass more than the fifth or sixth part of an inch from the extremity
of

of the canula; of this length it answers equally well as when the point is longer; and it is not so apt to wound the testis on being introduced into the cavity of the tunica vaginalis.

Fig. 2. A trocar, the invention of Mr André. Fig. 3. The canula of this instrument, formed of two hollow plates of elastic steel, firmly united together at their larger extremities by two screw-nails. The tube formed by these two hollow plates is of such a size as to allow the perforator, fig. 4. to be pushed into it with very little force; and the elasticity of the plates, which admits of their yielding to this passage of the perforator, enables them to return instantly to form the same size of tube, as soon as the large extremity of the instrument *A* has fairly passed the extremity of the plates.

The point of the perforator with a small portion of the extremity of the tube being pushed into the vaginal coat, the perforator is to be then withdrawn, which when the instru-

instrument is properly made may be done without much force.

The advantage which this instrument is supposed to have over any trocar of a different form, is, that the point of the perforator making a larger opening than is just necessary for the passage of the canula, the latter is thereby made to enter with more ease than it does in the usual form of the instrument.

But although this invention of Mr André's is neat and ingenious, it does not appear to be very necessary; for, when the other form of instrument is well finished, and the silver at the extremity of the canula is made very thin and properly fitted to the perforator, it enters with a great deal of ease. The canula of Mr André's instrument has this disadvantage too, that being made of fine polished steel, it is almost impossible to render it so dry after every time it is used, as to prevent it from suffering with rust, at the part where the two plates are fixed together by the screw-nails.

P L A T E X I.

(Opposite to page 535.)

Fig 1. and 2. Different parts of an instrument described p. 535. for performing the operation of phymosis.

Fig. 3. The two parts of the instrument connected and ready for use.

Fig. 4. A large impostume lancet.

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